SOIL SURVEY OF

Portage County, Ohio

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Ohio Department of Natural Resources
Division of Lands and Soil and
Ohio Agricultural Research and Development Center

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1965–72. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1972. This survey was made cooperatively by the Soil Conservation Service, the Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Portage Soil and Water Conservation District.

This survey was partly financed by the Tri-County Regional Planning Commission through a grant from the Urban Renewal Administration of the Housing and Home Finance Agency under the Urban Planning Assistance Program authorized by section 701 of the Housing Act of 1954, as amended.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Portage County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each soil. It also shows the page on which the soil is described and the woodland group in which it has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and can be colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussion of the woodland groups.

Foresters and others can refer to the section "Woodland" where the soils of the county are grouped according to their suitability for trees.

Wildlife managers and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Land use planning."

Engineers and builders can find, in the section "Engineering uses of the soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about the soils in the section "Formation and classification of the soils."

Newcomers in the area may be especially interested in the section "General soil map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General nature of the county."

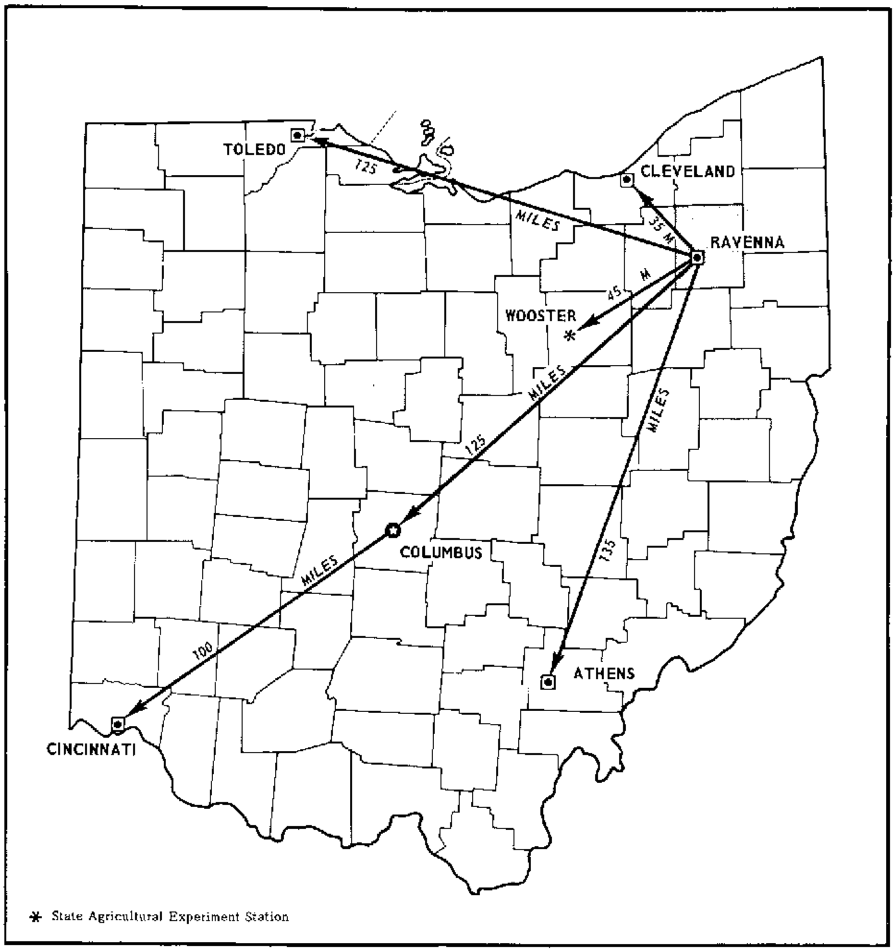
Cover: A typical landscape in the Chili-Oshtemo-Wooster association. The soils are well drained and overlie mainly sand or gravel or both. Most areas are used as hayland or pasture.

Contents

Issued June 1978

Index to Soil Mapping Units

Summary of Tables



Location of Portage County in Ohio.

SOIL SURVEY OF PORTAGE COUNTY, OHIO

By A. Ritchie, J. R. Bauder, and R. L. Christman, Ohio Department of Natural Resources, Division of Lands and Soil, and P. W. Reese, Soil Conservation Service

Fieldwork by A. Ritchie, J. R. Bauder, R. L. Christman, J. E. Ernst, R. K. Kosarko, D. K. Musgrave, K. R. Olson, N. E. Reeder, V. L. Riemenschneider, R. C. Roseler, and D. D. Waters, Ohio Department of Natural Resources, and P. W. Reese and G. J. Post, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Ohio Department of Natural Resources, Division of Lands and Soil, and Ohio Agricultural Research and Development Center

PORTAGE COUNTY is in the northeastern part of Ohio and has a total land area of 316,544 acres, or about 495 square miles. Ravenna, the county seat, is near the center of the county, about 14 miles east of Akron and 35 miles southeast of Cleveland.

County population in 1970 was 125,868. Kent is the largest city and has a population of 28,183, followed by Ravenna with a population of 11,780. Population estimates by the Tri-County Regional Planning Commission indicate that the county population will be about 166,000 in 1980 and about 244,000 in 2000.

The county is mostly farmland, but it is in an expanding metropolitan and industrialized area in northeastern Ohio, and an increasingly large acreage is being diverted to nonfarm use. Dairy farms, poultry farms, and cash grain crops are the main farm enterprises in the county. Nursery and greenhouse products are also a large source of income.

Ravenna and Kent are the principal industrial areas in the county. Rubber and plastics, transportation and construction equipment, cast metal, machine tools, and other metal products and textiles are the major items manufactured. The largest single industry in Portage County is the Ravenna Arsenal.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Portage County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have a profile almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. Bogart and Caneadea, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Chili loam, 2 to 6 percent slopes, is one of several phases within the Chili series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series or of different phases within one series. Two such kinds of mapping units, soil complexes and undifferentiated groups, are shown on the soil map of Portage County.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a com-

plex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Chili-Wooster complex, 18 to 30 percent slopes, is an example.

An undifferentiated group consists of two or more soils that could be mapped separately but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Geeburg and Glenford silt loams, steep, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called miscellaneous areas and are given descriptive names. "Urban land" is a miscellaneous area in Portage County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning on a watershed, a wooded tract, or a wildlife area or for broad planning of recreational facilities, community developments, and such engineering works as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils within an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey area have been grouped into general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in them are described on the following pages.

Soils That Formed Mostly in Glacial Till on Uplands

The associations in this group are throughout Portage County. Most of the soils are somewhat poorly drained to moderately well drained and deep or moderately deep to bedrock. Permeability is slow or very slow. The soils are mostly farmed and are used mainly for such commonly grown crops as corn, wheat, oats, grass-legume hay, and pasture. The acreage is about 72 percent of the county.

1. Mahoning-Ellsworth association

Nearly level to sloping, somewhat poorly drained and moderately well drained soils that formed mostly in moderately fine textured glacial till

This association is on uplands in the northwestern and eastern parts of the county. Topography is mostly nearly level to sloping areas interspersed with shallow depressions and drainageways. Some steeper areas are on the sides of valleys along major streams and in morainic areas. This association makes up about 27 percent of the county.

Mahoning soils make up about 50 percent of this association and Ellsworth soils make up 25 percent. Mahoning soils are nearly level to gently sloping and somewhat poorly drained. Unless drained, they are saturated in winter and spring. Ellsworth soils are mostly gently sloping to moderately steep, but a few areas are steep to very steep. They are seasonally wet, but for shorter periods than the Mahoning soils.

Poorly drained Trumbull and Holly soils and well drained Chili soils make up the rest of this association.

Seasonal wetness caused by a clayey, slowly permeable subsoil is a main limitation, particularly for use of the Mahoning soils in this association. Ponding is common in low-lying areas. Artificial drainage is a major management requirement for farming these soils. Seasonal wetness and slow permeability are severe limitations for such nonfarm uses as septic tank filter fields. Because they have better natural drainage, Ellsworth soils have fewer limitations than Mahoning soils for building sites. Much of this association has been used for dairying and cash-grain farming; however, farming has been declining in recent years. Many areas that were formerly farmed are returning to brush and woodland. Scattered residential and industrial developments are increasing.

2. *Canfield-Ravenna-Wooster association*

Nearly level to sloping, somewhat poorly drained to well drained soils that formed in medium textured glacial till and that have a fragipan

This association occupies a broad belt north and south of the city of Ravenna. It is on uplands. The topography is nearly level to sloping. A few steeper areas are on valley sides along major drainageways. Some of these steeper areas are stony and rocky. This association makes up about 16 percent of the county.

Canfield soils make up about 36 percent of this association, Ravenna soils 25 percent, and Wooster soils 15 percent. Canfield soils are mostly gently sloping and moderately well drained. Ravenna soils are less sloping than Canfield and Wooster soils and are somewhat poorly drained. Wooster soils are well drained, gently sloping to very steep, and typically have a less dense and compact fragipan than Canfield and Ravenna soils.

Less extensive soils make up the remaining 24 percent of this association. They include the well drained Loudonville and Chili soils and the poorly drained Sebring and Holly soils.

Temporary wetness on Canfield soils or seasonal wetness on Ravenna soils is caused by lateral movement of water along the top of the dense, compact fragipan and severely limits the use of both soils. Moderately slow permeability to slow permeability in the fragipan is an additional limitation of these soils and the Wooster soils for certain nonfarm uses. Erosion of areas being developed for nonfarm uses as well as of farmland results in sedimentation if it is not controlled. Dairy farming is the most important agricultural enterprise on this association. Cash-grain farming is also important.

3. *Remsen-Geeburg-Trumbull association*

Nearly level to gently sloping, moderately well drained to poorly drained soils that formed in fine textured glacial till

This association consists of a single, large, arc-shaped area that extends north from the Berlin Reservoir in southeastern Portage County to encircle the Westbranch Reservoir and then turns west toward the city of Ravenna. The topography is generally nearly level to gently sloping, but a few steeper areas are on valley sides along major drainageways. This association makes up about 15 percent of the county.

Remsen soils make up about 45 percent of this association, Geeburg soils 23 percent, and Trumbull soils 15 percent. Remsen soils are somewhat poorly drained and nearly level to gently sloping. Geeburg soils are moderately well drained and are gently sloping to steep. Trumbull soils are poorly drained and nearly level.

Sebring and Holly soils make up the rest of the association. They are poorly drained and are in low-lying areas.

Because of seasonal wetness caused by a clayey, very slowly permeable subsoil, Remsen and Trumbull soils have severe limitations for many land uses. Surface ponding is common on Trumbull soils during extended wet periods of the year unless adequate surface drainage is provided. The very slow permeability of the major soils in this association is a severe limitation for septic tank filter fields and for certain other nonfarm uses.

Agriculture is declining on this association, and many formerly cultivated areas are reverting to brush and woodland. Areas adjacent to the Berlin and Westbranch Reservoirs are used primarily for recreation and wildlife habitat.

4. *Wadsworth-Rittman association*

Nearly level to sloping, somewhat poorly drained and moderately well drained soils that formed in moderately fine textured glacial till and that have a fragipan

This association is on uplands mostly in the eastern half of the county. Although some areas are moderately steep to steep, the topography over most of the association is nearly level to sloping. This association makes up about 10 percent of the county.

Wadsworth soils make up about 52 percent of this association and Rittman soils, 27 percent. Wadsworth soils are somewhat poorly drained and nearly level to gently sloping. They are on the most nearly flat part of the uplands. Rittman soils are moderately well drained. They are mostly gently sloping, but range to steep along the larger streams.

The Loudonville, Dekalb, Chili, Sebring, and Holly soils make up most of the rest of this association. The Loudonville, Dekalb, and Chili soils are well drained, and the Sebring and Holly soils are poorly drained.

Excessive seasonal wetness on the Wadsworth soils and temporary wetness on Rittman soils is caused by the lateral movement of water along the top of the dense, compact fragipan and is a severe limitation to use of these soils. Slow permeability is a severe limitation for septic tank fields and certain other nonfarm uses. Erosion on the more sloping areas of Rittman soils, particularly where the vegetative cover is sparse or gone, is also a serious limitation. Although agriculture was formerly extensive in this association, it is declining. Residential, industrial, and other community developments are increasing.

5. *Loudonville-Mitiwanga-Dekalb association*

Gently sloping to steep, well drained and somewhat poorly drained soils that formed in moderately thick glacial till over bedrock and in residuum from sandstone

This association consists of scattered small areas that are concentrated mainly in northeastern Portage County. These areas are distinct features on the landscape. They are mainly broad, elongated hilltops at a high elevation. In some areas the side slopes have prominent escarpments. The topography is gently sloping to steep. The soils are moderately deep. They formed in loamy material overlying sandstone bedrock. This association makes up about 4 percent of the county.

Loudonville soils make up about 50 percent of this association, Mitiwanga soils 17 percent, and Dekalb soils 12 percent. Loudonville soils are well drained and are gently sloping to moderately steep. Mitiwanga soils are somewhat poorly drained and are gently sloping to sloping. Dekalb soils are well drained and are on the steepest parts of this association. Numerous outcrops

of sandstone bedrock are included with the DeKalb soils.

The Mitiwanga variant and other soils make up the rest of this association. The Mitiwanga variant soils are moderately well drained.

Shallowness to bedrock and, where slopes are steep, a severe erosion hazard are the main limitations to the use of this association. Excavation and construction projects are seriously hampered by the shallowness to bedrock. Seasonal wetness is an additional limitation to the use of the Mitiwanga soils. Many of the steeper parts of the association are wooded, and the less sloping areas are used for crops or pasture. The association has many scenic areas and overlooks.

Soils That Formed Mostly in Glacial Outwash on Terraces

The associations in this group are mainly in the valleys of the Cuyahoga River and its tributaries. The soils formed mostly in loamy, sandy, and gravelly material and, in some places, in glacial till. They are mostly loamy or sandy, very permeable, and well drained. They are used mainly for field crops commonly grown in the county and for some specialty crops. These associations make up about 22 percent of the county.

6. Chili association

Nearly level to sloping, well drained soils that formed in loamy material overlying sand and gravel

This association is on terraces bordering the Cuyahoga River, mostly in the western half of Portage County. The topography is nearly level to sloping. Some low-lying areas are swampy. This association makes up about 15 percent of the county.

Chili soils make up about 50 percent of this association. They are well drained and permeable. They absorb rainfall readily and contribute seepage to the high water table of soils in low-lying areas.

Oshtemo, Wheeling, Jimtown, Fitchville, Sebring, and Holly soils and Carlisle muck make up the rest of the association. Oshtemo and Wheeling soils are well drained, Jimtown and Fitchville soils are somewhat poorly drained, Sebring and Holly soils are poorly drained, and Carlisle muck is very poorly drained. Oshtemo, Wheeling, Jimtown, and Fitchville soils are in low–lying areas, and Carlisle muck is in swampy depressions.

Because of good natural drainage and generally favorable topography, Chili soils and other well drained soils in this association have few limitations for many farm and nonfarm uses. Droughtiness, particularly in summer and early in fall, and erosion on the sloping soils are limitations for farm uses. These soils have few limitations for such uses as homesites. If septic tanks are used for sewage disposal, however, there is a possibility of polluting the ground water, particularly in high density subdivisions.

Much of the acreage of this association is used for farming, but its use for community development is increasing. Chili soils are well suited to truck crops and to irrigation. The underlying sand and gravel of the Chili and Oshtemo soils is suitable for commercial use.

7. Chili-Oshtemo-Wooster association

Sloping to very steep, well drained soils that formed in sandy or loamy material overlying sand or gravel or both and sloping to very steep, well drained soils that formed in loamy glacial till and that have a fragipan

This association is in four areas. The largest area is in the southwestern part of the county. The topography is mostly sloping to very steep, but there are bogs and shallow basins in places. This association makes up about 7 percent of the county.

Chili soils make up about 45 percent of this association (fig. 1), Oshtemo soils 15 percent, and Wooster soils 10 percent. Chili soils are well drained and permeable. They are underlain by sandy and gravelly material. Oshtemo soils are also well drained and permeable. They formed in sandy material. Wooster soils are well drained but are less permeable than Chili and Oshtemo soils. They formed in loamy glacial till.

Carlisle muck and Damascus, Jimtown, Bogart, Sebring, and Fitchville soils make up the rest of this association. These soils are wet and are in low-lying areas. Carlisle muck is very poorly drained; it is in bogs and depressions.

Slope is the main limitation to farming the major soils. The hazard of erosion is severe in some areas if these soils are used for row crops. Droughtiness is a limitation for some uses. Slope is also a limitation for many nonfarm uses. Many areas have scenic value. Wooster soils have moderate limitations for such uses as septic tank filter fields because they are moderately slowly permeable. Many of the steeper soils in this association are wooded. The sand or gravel underlying the Chili and Oshtemo soils in some areas is suitable for commercial use.

Soils That Formed in Lacustrine, Alluvial, or Organic Deposits on Terraces, Flood Plains, and Glacial Uplands

Soils in this group of associations are scattered throughout the county, but are mostly in flat or depressional areas in the valleys. A few areas of organic soils are in upland depressions. Most of the soils are poorly drained or very poorly drained and have a silty, clayey, or organic subsoil. If adequately drained, these soils are used for crops commonly grown in the county. The acreage is about 6 percent of the county.

8. Sebring-Holly-Caneadea association

Nearly level to gently sloping, poorly drained and somewhat poorly drained soils that formed in lacustrine material in post-glacial lake basins and in alluvial material on flood plains

This soil association is in low-lying basins and drainageways between uplands mainly in the northern half of the county. The topography is nearly level to gently sloping. Streams that traverse the areas have a very low gradient and are very sluggish, and undrained areas are ponded for long periods throughout the year. This association makes up about 5 percent of the county.

Sebring soils make up about 35 percent of the association, Holly soils about 35 percent, and Caneadea

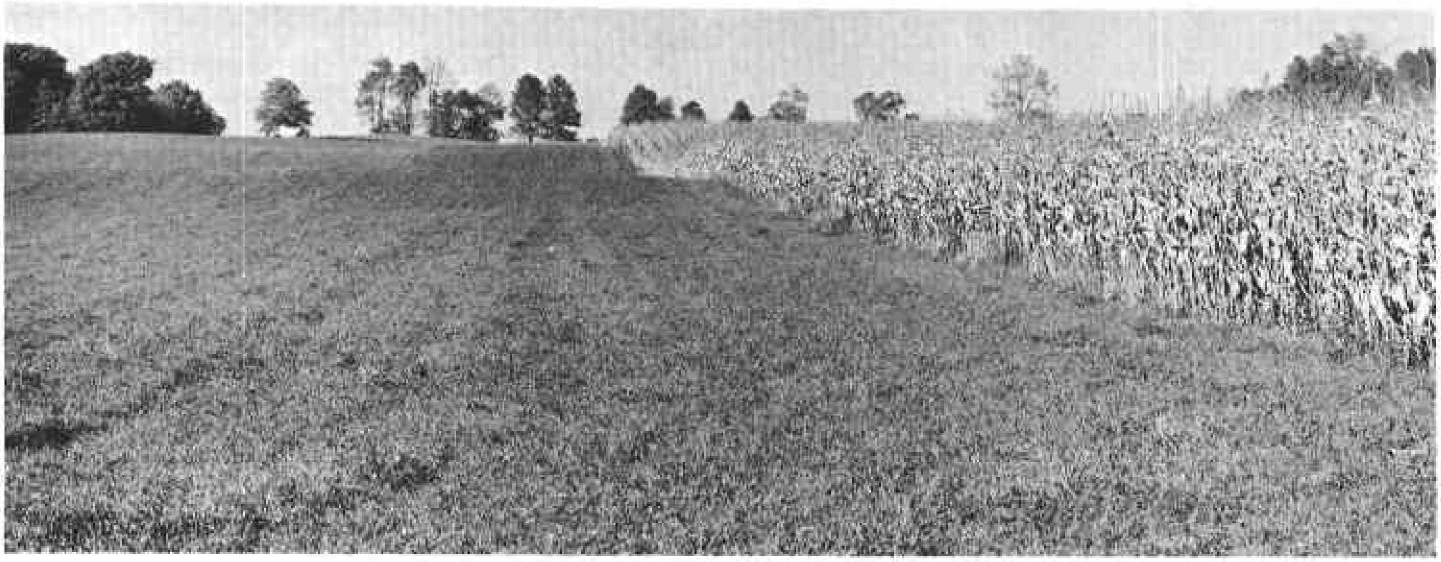


Figure 1.—**Hay and corn on gently sloping Chili soils. These soils are subject to erosion.**

soils about 6 percent. Sebring soils are poorly drained and are silty, whereas Holly soils are poorly drained and are loamy. Caneadea soils are somewhat poorly drained and are clayey. Canadice, Lorain, Carlisle, and Linwood soils make up the rest of this association. Canadice soils are poorly drained; Lorain soils, Carlisle muck, and Linwood muck are very poorly drained.

Excessive wetness and ponding for long periods are the major limitations. Poor stability and softness of the soil when saturated are severe limitations for nonfarm uses. Holly soils have severe limitations because of seasonal flooding. Because of the almost flat landscape, artificial drainage outlets are difficult to install on most parts of this association. As a result, most areas have remained undrained and some of them are used as wetland pasture or woodland. This association has potential either as wetland wildlife sanctuaries or as pond sites.

9. Carlisle association

Depressional to level, very poorly drained soils that formed in organic material

This association consists of small areas scattered throughout the western half of the county. The landscape is one of level and depressional bogs and basins. The soils are very poorly drained and are conspicuous by their dark color. This association makes up about 1 percent of the county.

Carlisle muck makes up about 70 percent of this association. It is very poorly drained and formed in thick layers of organic material.

Linwood, Lorain, and Olmsted soils make up the rest of this association. These minor soils are also very poorly drained.

Extreme wetness, which includes ponding for extended periods of the year, is the major limitation of Carlisle soils for nearly all uses. Subsidence, wind erosion, and fire are hazards if these soils are drained for farming. Softness of the soil and poor stability are severe limitations for construction and other nonfarm uses. Artificial drainage has been installed in some areas and the soils are used for cultivated crops and sod production. Undrained areas are commonly swampy and support only a dense growth of water-tolerant vegetation. This association has potential for nature study areas and open areas adjacent to community developments. Carlisle and Linwood soils are well suited to vegetable crops and sod if they are drained and properly managed.

Use and Management of the Soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

Information in this section is useful in planning use and management of soils for crops, pasture, and woodland, and as sites for buildings, highways and other transportation systems, sanitary facilities, parks and other recreation facilities, and wildlife habitat. From the data presented, the potential of each soil for specific land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Crops

The main field crops grown in the county are corn, soybeans, wheat, and oats. For specific information concerning fertilization, crop varieties, drainage, erosion control, tillage, and other management practices, contact the local office of the Soil Conservation Service or the Ohio Cooperative Agricultural Extension Service.

Most of the soils in the county are naturally acid and are low in plant nutrients. The addition of lime and fertilizer is needed and should be based on the results of soil tests, the needs of the crop, and on the level of yield desired.

Most of the soils in the county were never high in organic matter content, and it is not economical to build up the content to a high level. To maintain an adequate level, all crop residue and manure should be returned to the soil. When such crops as soybeans or potatoes, which produce little residue, are grown, cover crops, green manure crops, or sod crops should be included in the cropping system.

Many of the soils in the county need improved drainage for optimum crop production. Wetness is a hazard on most of the somewhat poorly drained, poorly drained, and very poorly drained soils. If undrained, these soils warm up slowly in spring, and tillage and crop growth is delayed. Crops grow well on these soils, however, if excess water is removed. Drainage practices include land smoothing, surface drainage, and tile drainage.

All of the gently sloping and steeper soils are subject to erosion if they are cultivated. Erosion control practices commonly used include the use of grassed waterways, contour tillage, contour stripcropping, diversions, minimum tillage, use of crop residue, and maintenance of close-growing crops for cover.

Tillage tends to break down soil structure. If tilled when too wet, many of the soils are easily compacted. Tillage should be kept to a minimum in preparing a seedbed and controlling weeds.

A cropping system should include the proper sequence of crops grown under good management. A cropping system is satisfactory if it improves or maintains good soil tilth; protects the soil from erosion; helps control weeds, insects, and plant diseases; and is of economic value. Crop rotations that include grasses and legumes as well as those that do not can be used. As the intensity of rowcropping increases, the need for conservation measures and intensive management also increases.

Pasture

A high level of pasture management provides for maintenance of an adequate fertility level, control of grazing, selection of pasture mixtures compatible with the soil type, control of erosion, and improvement of drainage. Pasture and hay plants commonly grown in the county include alfalfa, Ladino clover, red clover, timothy, birdsfoot trefoil, orchardgrass and bromegrass.

Erosion control is important because some of the soils used for pasture are sloping and are already eroded. Tillage and seeding should be done on the contour. Seeding pastures in a small grain crop also helps reduce the hazard of erosion. Pastures should not be overgrazed. A dense cover should be maintained to minimize erosion and to provide for plant regrowth.

Improved drainage is necessary on most somewhat poorly drained, poorly drained, and very poorly drained soils. For optimum production and for a wider choice of pasture plants, drainage should be as good as that provided for row crops. If only surface drainage is provided, pasture plants that will tolerate some wetness should be selected.

The need for lime and fertilizer should be determined by soil tests, the kinds of plants grown, and the needs of the grower.

Trampling by animals or tilling when too wet causes soil compaction and reduces production. The use of proper stocking rates and rotation or deferred grazing and location of watering facilities are also important.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when they are used for field crops, the risk of damage and how they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soil. It does not take into consideration possible but unlikely major reclamation projects, and does not apply to horticultural crops or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when they are used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils used for forest trees or engineering.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

- Class I soils have few limitations that restrict their use.
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Class III soils have severe limitations that reduce the choice of plants, that require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, that require very careful management, or both.
- Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat (none in Portage County).
- Class VI soils have severe limitations that make them generally unsuited to cultivated crops and that limit their use largely to pasture, woodland, or wildlife habitat.
- Class VII soils have very severe limitations that make them unsuited to cultivated crops and that restrict their use largely to pasture, woodland, or wildlife habitat.
- Class VIII soils and landforms have limitations that preclude their use for commercial plants and that restrict their use to recreation, wildlife habitat, water supply, or to esthetic purposes (none in Portage County).

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The

letter *e* shows that the main limitation is the hazard of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivated crops (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the main limitation is shallowness, droughtiness, or stoniness; and *c*, used in some parts of the United States, but not in Portage County, shows that the chief limitation is climate that is too cold or too dry.

In Class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in Class V are subject to little or no erosion, although they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation; and the Arabic numeral specifically identifies the capability unit within each subclass.

The soils in Portage County have been placed into 33 capability units. The soils in each unit have about the same kinds of limitations, are subject to similar risks of damage, need about the same kind of management, and respond to management in about the same way. Mapping units that include Urban land have not been placed into a capability unit because they are generally the sites for industrial, residential, or other community developments.

The capability units in Portage County are described in the following pages, and suggestions are given for the use and management of the soils in each capability unit. To determine the capability classification of any given mapping unit, refer to the "Guide to Mapping Units" at the back of this survey. Also, the capability unit assigned to any soil is listed at the end of the description of that soil in the section "Descriptions of the Soils."

In the discussions of the capability units, optimum level of management is mentioned. Optimum management is defined in the section "Estimated yields."

Depth of the root zone refers to the depth of the soil to a high water table, a fragipan, a layer of dense clay or compact till, bedrock, or other material that restricts the growth of roots. Low, moderate, or high available water capacity affects the normal depth of roots of corn, small grain, or other commonly grown field crops.

The capability unit descriptions emphasize soil features that limit the use of the soils for cultivated crops or pasture. Only general suggestions for overcoming these limitations are given. There are, however, many specific practices, or combinations of practices suitable for controlling erosion or improving drainage. Additional information concerning erosion control, drainage, choice of crop varieties, or other management practices can be obtained from local offices of the Soil Conservation Service or the Ohio Cooperative Extension Service.

CAPABILITY UNIT I-1

This capability unit consists of well drained to moderately well drained, level to nearly level soils that formed in water-deposited material on terraces. These soils have a surface layer of silt loam. They have a deep root zone, moderately slow to moderate permeability, and a moderate to high available water capacity. They have a high productivity potential.

There are no major features that limit the use of these soils for cultivated crops or pasture. Artificial drainage is generally not required. Some of the soils in this capability unit have a seasonal high water table for relatively short periods of time in winter and early in spring, but generally this does not delay planting in spring. Soil structure can be maintained by growing crops that supply large amounts of crop residue.

These soils are suited to all grain and hay crops or pasture plants commonly grown in the county. They are suited to but generally not used as pasture. They are also suited to such specialized crops as potatoes or sweet corn. Cultivated crops can be grown year after year under optimum management. These soils are suited to sprinkler irrigation.

CAPABILITY UNIT IIe-1

This capability unit consists of moderately well drained and well drained, gently sloping soils on water-deposited terraces, in old glacial lakebeds, and on uplands. Those on uplands formed in loam glacial till. These soils have a surface layer of silt loam. They have a moderately deep to deep root zone, moderate to moderately slow permeability, and a moderate available water capacity. These soils have a moderately high productivity potential.

The hazard of erosion is the major limitation to use of these soils for cultivated crops. Maintenance of high fertility, good soil structure, and organic-matter content are other concerns if these soils are cultivated frequently.

These soils are suited to all grain and hay crops or pasture plants grown in the county. Most of these soils provide excellent early pasture. They are also suited to such specialty crops as potatoes and sweet corn. They can be used frequently for cultivated crops under optimum management. They are suited to sprinkler irrigation if erosion is controlled.

CAPABILITY UNIT IIe-2

This capability unit consists of moderately well drained, gently sloping soils. These soils have a surface layer of silt loam. They have a dense, compact fragipan in the lower part of the subsoil which restricts air and water movement and root penetration. Because of the fragipan, the root zone is only moderately deep. Permeability is slow, and the available water capacity is moderate. These soils have a perched water table above the fragipan in winter and spring.

The hazard of erosion is moderate in cultivated areas. The soils not only contain a perched water table, but wetness may occur near the base of slopes and along

drainageways. Tile drainage of the wetter areas is needed for optimum production and timely cultivation. Surface crusting and the maintenance of optimum fertility, good soil structure, and organic matter content are concerns if these soils are frequently cultivated.

These soils are suited to all grain and hay crops or pasture plants commonly grown in the county. They can be used frequently for cultivated crops under optimum management. An adequate cover of plants is needed in pastures to protect the soils from erosion. Pasturing when wet damages soil structure, quality of plant cover, and forage production.

CAPABILITY UNIT IIe-3

This capability unit consists of well drained, gently sloping soils that are moderately deep to bedrock. These soils have a moderately deep root zone overlying the bedrock, moderate to rapid permeability, and a moderate to low available water capacity. They have a moderate productivity potential.

A moderate hazard of erosion is the major limitation to use of these soils for cultivated crops. There is a hazard of drought on soils that have a surface layer of channery loam.

These soils are suited to all grain and forage crops or pasture plants commonly grown in the county. Plant growth on the droughty soils in this capability unit may be limited during extended dry periods because of their low available water capacity. These soils are suited to sprinkler irrigation if erosion is controlled. If these soils are used for pasture, adequate amounts of lime and fertilizer are needed to maintain a dense plant cover and to control erosion.

CAPABILITY UNIT IIe-4

This capability unit consists of well drained and moderately well drained, gently sloping soils underlain by sand and gravel. These soils are on stream terraces, outwash plains, or glacial kames. They have a moderately deep to deep root zone, moderately rapid to rapid permeability, and a low to moderate available water capacity. They warm up early in spring and are easy to till. These soils have a moderate productivity potential.

A moderate hazard of erosion is the major limitation to use of these soils for cultivated crops. The surface layer is not subject to crusting and can be tilled within a few hours after a heavy rain. There is a moderate hazard of drought during extended dry periods. Returning large amounts of crop residue helps maintain or improve the organic-matter content. Soluble plant nutrients are easily removed by leaching.

These soils are suited to grain and forage crops or pasture plants commonly grown in the county. They are also suited to such specialty crops as sweet corn and potatoes. They are well suited to sprinkler irrigation. They are better suited to early-maturing crops than to full-season crops because of their moderate to low available water capacity. Hay or pasture mixtures should contain deep rooted, drought-resistant plants.

CAPABILITY UNIT IIw-1

Tioga loam, the only soil in this capability unit, is a well drained, loamy, nearly level soil on flood plains. It is subject to periodic flooding, especially in winter and early in spring. This soil has a deep root zone, moderate to moderately rapid permeability, and a moderate available water capacity. It has a high productivity potential.

Seasonal flooding is the major limitation to use of this soil for cultivated crops. This soil warms up early in spring, is easy to till, and does not crust severely.

This soil is suited to most grain and forage crops or pasture plants commonly grown in the county. Such fall planted crops as wheat may be damaged by flooding. This soil is also suited to such specialty crops as sweet corn or potatoes. It can be used frequently for row crops under optimum management. It is suited to sprinkler irrigation.

CAPABILITY UNIT IIw-2

Orrville silt loam, the only soil in this capability unit, is a nearly level, somewhat poorly drained soil on flood plains. This soil has a seasonal high water table and is subject to flooding, generally in winter and in spring. This soil has a deep root zone, moderate permeability, and a high available water capacity if it is drained. It has a moderately high productivity potential.

Wetness and susceptibility to flooding are the major limitations to use of this soil.

If properly drained, this soil is suited to most grain and forage crops or pasture plants commonly grown in the county. Fall planted crops, such as wheat, may be severely damaged by flooding. This soil is better suited to pasture and meadow crops than to cultivated crops if it is not adequately drained. Seeding mixtures should contain grasses and legumes that will tolerate some wetness.

CAPABILITY UNIT IIw-3

This capability unit consists of somewhat poorly drained to moderately well drained, nearly level to gently sloping soils that formed in loamy glacial till on uplands. These soils have a surface layer of silt loam. They have a dense, compact fragipan in the lower part of the subsoil which restricts root depth and water percolation. They have a moderately deep root zone and a moderate available water capacity. They have a moderately high productivity potential.

A moderate hazard of wetness, caused by slow runoff and slow percolation through the fragipan, is the major limitation to use of these soils. There is a moderate hazard of erosion if the gently sloping areas are cultivated.

If adequately drained, these soils are suited to most grain and forage crops or pasture plants commonly grown in the county. They can be used frequently for cultivated crops under optimum management. Returning large amounts of crop residue helps maintain soil tilth.

Plants that tolerate seasonal wetness should be grown for pasture and hay crops. Pasturing when wet will damage soil structure, reduce quality of plant cover, and lower forage production.

CAPABILITY UNIT IIw-4

This capability unit consists of somewhat poorly drained and moderately well drained, nearly level to gently sloping soils that formed in stratified deposits, mainly loamy or sandy in texture. These soils have a

surface layer mostly of silt loam or loam. All of these soils have a seasonal high water table in winter and in spring. They have a moderately deep root zone, moderate to moderately slow permeability, and a low to high available water capacity. They have a moderate productivity potential.

A moderate hazard of wetness and a hazard of erosion on the sloping areas are the major limitations of these soils. Unless they are artificially drained, these soils dry out and warm up slowly in spring.

If adequately drained, these soils are suited to most grain and forage crops or pasture plants commonly grown in the county. They can be used frequently for cultivated crops under optimum management. Plants that tolerate seasonal wetness should be grown for pasture and forage crops. Pasturing when wet will damage soil structure, reduce the quality of vegetative cover, and reduce forage production.

CAPABILITY UNIT IIw-5

This capability unit consists of poorly drained or very poorly drained, nearly level soils that formed in stratified deposits ranging from silty to gravelly in texture. These soils have a surface layer of silt loam or loam. They have a moderately deep to deep root zone if drained, moderately rapid to moderately slow permeability, and a moderate to high available water capacity. If drained, these soils have a medium to high productivity potential.

Wetness is the major limitation to use of these soils for cultivated crops. They must be drained for satisfactory production.

If adequately drained, these soils are suited to most grain and forage crops or pasture plants commonly grown in the county. They can be frequently cultivated under optimum management. Pastures and hayland also require drainage for satisfactory production. Seeding mixtures should contain grasses and legumes that can tolerate some wetness. Pasturing when wet will compact the soils and reduce production.

CAPABILITY UNIT IIs-1

This capability unit consists of well drained and moderately well drained, nearly level soils that formed in loamy material underlain by sand and gravel deposits on stream terraces and glacial kames. These soils have a surface layer of loam and silt loam. They have a moderately deep to deep root zone, moderately rapid to rapid permeability, and a moderate to low available water capacity. They warm up early in spring. These soils have a moderate productivity potential.

A moderate hazard of drought is the major limitation of these soils. The surface layer in most areas is not subject to crusting and can be tilled within a few hours after a heavy rain. Returning large amounts of crop residue helps increase the available water capacity of these soils. Soluble plant nutrients may be removed by leaching.

These soils are suited to all grain and hay crops and pasture plants commonly grown in the county as well as to such adapted specialty crops as early sweet corn and potatoes. They are well suited to sprinkler irrigation. They can be used frequently for cultivated crops under optimum management. Unless irrigated, they are better suited to early-maturing crops than to full-season crops because of their moderate to low available water capacity. Hay or pasture mixtures should include deep-rooted plants that are drought-resistant.

CAPABILITY UNIT IIIe-1

This capability unit consists of well drained and moderately well drained, sloping soils that formed in loam glacial till or stratified silts and clays. These soils have a surface layer of silt loam. In the moderately eroded areas, about half of the original surface layer has been eroded away and the plow layer is a mixture of the original surface layer and the upper part of the subsoil. The soils in this capability unit have a deep root zone, moderate to moderately slow permeability, and a moderate to high available water capacity. They have a moderate productivity potential.

A severe hazard of erosion is the major limitation to use of these soils for cultivated crops. The surface layer is susceptible to crusting, especially in the more eroded areas. Runoff is rapid.

These soils are suited to most grain and hay crops or pasture plants commonly grown in the county. They are also suited to specialty crops under optimum management. They are better suited to deep-rooted plants that mature early than to summer full-season crops. Returning large amounts of crop residue helps reduce the hazard of erosion on these soils.

CAPABILITY UNIT IIIe-2

This capability unit consists of well drained and moderately well drained, sloping soils that formed in loam or clay loam glacial till. These soils have a surface layer of silt loam, and they have a dense, compact fragipan in the lower part of the subsoil. They are moderately permeable above the fragipan but are slowly permeable in and below the fragipan. They have a perched water table above the fragipan during winter and spring. These soils have a moderately deep root zone, moderate available water capacity, and a moderate productivity potential. Some of the soils in this capability unit have been moderately eroded, and the plow layer is a mixture of the original surface layer and the upper part of the subsoil.

A severe hazard of erosion is the major limitation to use of these soils for cultivated crops. If the soil above the fragipan is saturated, runoff is increased. The surface layer is susceptible to crusting, especially in the more eroded areas.

These soils are suited to most grain and forage crops or pasture plants commonly grown in the county. They can be used frequently for cultivated crops under optimum management. Under prevailing management, erosion control practices should be emphasized. An adequate cover of plants is needed in pastures and hayfields to protect the soils from erosion.

CAPABILITY UNIT IIIe-3

This capability unit consists of well drained, sloping, loamy soils that formed in glacial till or stratified gravelly, sandy, or loamy outwash material on terraces or glacial kames. These soils have a surface layer of silt loam, loam, sandy loam, or gravelly loam. They have a moderately deep or deep root zone, moderately rapid to moderate permeability, and a moderate to low

available water capacity. They warm up early in spring and are easy to till. All of these soils have a moderate productivity potential.

A severe hazard of erosion is the major limitation to use of these soils for cultivated crops. There is a hazard of drought on the lighter textured soils. The surface layer in most areas is not subject to crusting and can be tilled within a few hours after a heavy rain. Returning large amounts of crop residue helps increase the available water capacity of these soils.

These soils are suited to many grain and forage crops or pasture plants commonly grown in the county. They are better suited to early maturing crops than to full-season crops because of their moderate to low available water capacity. They can be used frequently for cultivated crops under optimum management. Under prevailing management, erosion control practices should be emphasized. Early pasture on these soils provides a good supply of forage, but growth is retarded in summer because of reduced available moisture. An adequate cover of plants is needed in pastures and hayfields to protect the soils from erosion.

CAPABILITY UNIT IIIe-4

This capability unit consists of moderately well drained, gently sloping soils that formed mostly in clayey glacial till. A few soils are underlain by bedrock at a depth of 20 to 40 inches. These soils have a moderately deep root zone, slow to very slow permeability, and a moderate available water capacity. They have a moderate productivity potential.

A severe hazard of erosion is the major limitation to use of these soils for cultivated crops. Because of the slow permeability, runoff is rapid, especially when the upper part of the profile is saturated. These soils dry out slowly in spring and after wet periods. They have a narrow range of optimum moisture conditions for tillage. Soil structure is easily destroyed, and the soils become cloddy if tilled when wet. They are also susceptible to crusting.

These soils are suited to many grain and forage crops or pasture plants commonly grown in the county. They are not suited to specialty crops or intensive cultivation. They can be used frequently for cultivated crops under optimum management. An adequate cover of plants is needed in pastures and hayfields to protect the soils from erosion. Pasturing when wet destroys soil structure, reduces the quality of vegetative cover for erosion control, and lowers forage production.

CAPABILITY UNIT IIIe-5

This capability unit consists of well drained, sloping soils that are moderately deep over bedrock. These soils have a surface layer of channery loam or silt loam. They have a moderately deep root zone, moderate to rapid permeability, and a moderate to low available water capacity. These soils have a moderate productivity potential. They dry out early in spring and are easy to till.

A severe hazard of erosion is the major limitation to use of these soils for cultivated crops. There is a moderate hazard of drought on the soils that have a channery surface layer.

These soils are suited to many grain and forage crops or pasture plants commonly grown in the county. Crop growth on the channery soils may be limited during periods of low rainfall because of the limited available water capacity. These soils are generally better suited to early-maturing crops. Early pasture on these soils provides a good supply of forage, but growth is retarded in summer because of reduced available water supply. An adequate cover of plants is needed in the pastures and hayfields to protect the soils from erosion.

CAPABILITY UNIT IIIw-1

This capability unit consists of poorly drained and very poorly drained, level soils on flood plains that formed in silty material or silty material overlying muck. These soils have a surface layer of silt loam. They have a seasonal high water table and are subject to flooding, especially in winter and in spring. Depressional areas of these soils are ponded for extensive periods. If drained, these soils have a deep root zone, moderate to moderately slow permeability, and a high available water capacity. They have a medium to high productivity potential.

Severe wetness and a hazard of flooding are the major limitations to use of these soils for cultivated crops. Intensive drainage and protection from flooding are needed for optimum production of grain crops. Drainage outlets are difficult to establish, because the soils in this capability unit are commonly only slightly above the level of the streams.

If properly drained and protected from flooding, these soils are suited to most grain and forage crops or pasture plants commonly grown in the county. They can be used frequently for cultivated crops under optimum management. If not adequately drained or if flooding is severe, these soils are better suited to pasture. Seeding mixtures should contain grasses and legumes that will tolerate some wetness. The adequately drained areas are very well suited to pasture, especially during dry periods. These soils are generally too wet for grazing early in spring. Depressional areas are suited to development for wetland wildlife habitat.

CAPABILITY UNIT IIIw-2

This capability unit consists of very poorly drained muck soils that formed in organic material or organic material underlain by loamy mineral material. These soils have a water table at or near the surface most of the year unless they are drained. They must be drained for crop production. Permeability is moderately rapid to rapid, but is slow in the underlying material where it consists of loamy mineral material. These soils have a high available water capacity and a high productivity potential.

Unless drained, these soils generally are not suited to cultivated crops or pasture. Severe wetness is the major limitation to use of these soils for cultivated crops. A drainage and water level management system is needed to control the height of the water table, in order to provide a root zone and also prevent subsidence of the muck. During dry periods, these soils are subject to soil blowing and fire damage.

They can be used frequently for cultivated crops under optimum management. Corn and soybeans are the most commonly grown crops. These soils are well suited to such vegetables as lettuce, celery, sweet corn, and potatoes and to sod. Crops grown on these low-lying

soils are relatively more susceptible to frost damage during spring and fall than those grown on higher soils. They are well suited to irrigation. Grasses and legumes that will tolerate wetness should be seeded. These soils are well suited to wetland wildlife habitat.

CAPABILITY UNIT IIIw-3

This capability unit consists of poorly drained soils that formed in sandy and gravelly glacial outwash, and in silty and clayey materials deposited by water. They occupy nearly level and depressional areas on stream terraces and outwash plains. These soils have a surface layer of loam or silt loam. They have a high seasonal water table in winter, spring, and early in summer. If drained, they have a moderately deep root zone, moderately rapid to moderately slow permeability, and a medium to high available water capacity. These soils have a moderate productivity potential.

A severe hazard of wetness is the major limitation to use of these soils for cultivated crops. They must be drained for farming. Drainage is difficult to install if the soil is unstable. Soils that have a surface layer of silt are susceptible to crusting.

If adequately drained, these soils are suited to some of the grain and forage crops or pasture plants commonly grown in the county. They are suited to pasture and hay crops that can tolerate some soil wetness. They can be used frequently for cultivated crops under optimum management. If less than optimum management is used, the soil structure is likely to deteriorate and these soils become less suitable for cultivated crops. These soils will provide pasture during dry periods, but are commonly too wet for grazing early in spring.

CAPABILITY UNIT IIIw-4

This capability unit consists of somewhat poorly drained, nearly level and gently sloping soils that formed in clayey glacial till or in clayey deposits in old glacial lakebeds. These soils have a surface layer of silt loam and a clayey subsoil. Mitiwanga and Hornell soils are moderately deep over bedrock. They have a moderately deep root zone, moderate to very slow permeability, and a moderate available water capacity. They have a moderate productivity potential.

A severe hazard of wetness is the major limitation to use of these soils for cultivated crops. Unless these soils are artificially drained, they are poorly suited to cultivated crops. There is also an erosion hazard in gently sloping areas. These soils are subject to crusting. They have a narrow range of moisture content for optimum tillage operations. Soil tilth will be destroyed and the soils will clod if tilled when too wet. Erosion control practices that do not contribute to wetness are needed on the gently sloping soils.

Under optimum management, these soils are suited to many grain and hay crops or pasture plants commonly grown in the county. Erosion is generally excessive in the gently sloping areas, and, under prevailing management, soil structure deteriorates if cultivated crops are grown frequently. In dry years crops that mature in summer are likely to be damaged by drought. Management should stress drainage, timely cultivation, and the return of large amounts of crop residue. Pasture and meadow seeding mixtures should include grasses and legumes that will tolerate wetness. Because the clayey subsoil restricts the development of roots and frost action is likely to cause heaving, these soils are poorly suited to alfalfa or other deep-rooted crops. Soil compaction results if these soils are grazed when wet.

CAPABILITY UNIT IIIw-5

This unit consists of somewhat poorly drained, nearly level and gently sloping soils that formed in clay loam glacial till. These soils have a dense, compact fragipan in the lower part of the subsoil that restricts water percolation and root penetration. They have a moderately deep root zone, slow permeability, and a moderate available water capacity. They have a perched water table late in winter, in spring, and early in summer. These soils have a moderate productivity potential.

A severe hazard of wetness is the main limitation to use of these soils for cultivated crops. There is a hazard of erosion on the gently sloping soils. These soils will crust and clod if they are cultivated when wet. They dry out slowly in spring unless drained.

These soils are suited to most grain and hay crops or pasture plants commonly grown in the county. Drainage is necessary for optimum crop production. The soils can be used frequently for cultivated crops under optimum management, but special care is needed to keep them in good tilth. Pasture and meadow seedings should contain grasses and legumes that will tolerate wetness. These soils are poorly suited to alfalfa or plants that are damaged by frost heaving. Grazing these soils when wet will cause compaction and reduce yields.

CAPABILITY UNIT IIIw-6

Frenchtown silt loam is the only soil in this capability unit. It is a nearly level, poorly drained soil that formed in loam glacial till. This soil has a dense, compact fragipan in the lower part of the subsoil that restricts water percolation and root penetration. It has a moderately deep root zone, slow permeability, and a moderate available water capacity. This soil has a water table perched at or near the surface late in winter, in spring, and early in summer. If drained, it has a moderate productivity potential.

A severe hazard of wetness of long duration is the major limitation to use of this soil for cultivated crops. There is a narrow range of moisture conditions for optimum tillage operations. This soil is susceptible to crusting. Drainage is necessary for optimum production.

This soil is suited to some of the grain and hay crops or pasture plants commonly grown in the county. It can be used frequently for cultivated crops under optimum management, but special care is needed to maintain good soil structure. Drained areas are better suited to cultivated crops than undrained areas.

This soil is suited to those pasture and hay plants that can tolerate seasonal wetness. It is poorly suited to alfalfa and other legumes that can be damaged by frost heaving. Drainage generally improves the soil for pasture. Pasturing this soil when wet is likely to cause compaction and reduce yields.

CAPABILITY UNIT IIIw-7

Lorain silty clay loam is the only soil in this capa-

bility unit. It is a very poorly drained soil that formed in depressional areas of former lakebeds. This soil has a moderately deep root zone if drained, slow permeability, and a moderate to high available water capacity. It has a high water table in winter, in spring, and early in summer. Unless drained, it is often ponded for extensive periods. It has a high productivity potential.

Wetness is the major limitation to use of this soil for cultivated crops. This soil can be satisfactorily tilled within a narrow range of moisture content. It becomes compacted and cloddy if worked when wet.

If adequately drained, this soil is suited to most row and hay crops or pasture plants commonly grown in the county. It can be used frequently for row crops under optimum management. Well-managed pastures are productive, particularly during dry periods. Pasturing when wet will damage soil structure and reduce forage yields. Seeding mixtures should contain legumes and grasses that will tolerate some wetness. Undrained areas are best suited to pastured woodland or wetland wildlife habitat.

CAPABILITY UNIT IIIs-1

This capability unit consists of well drained, gently sloping and sloping soils that formed over deep, sandy glacial outwash. These soils have a deep root zone, rapid to moderately rapid permeability, and a low available water capacity. They have a low capacity for the storage and release of plant nutrients. Soluble plant nutrients are readily leached from these soils. They dry out and warm up early in spring. They have a low productivity potential.

A severe hazard of drought is the major limitation to use of these soils for cultivated crops. The soils are also subject to soil blowing and water erosion.

These soils are suited to most field crops commonly grown in the county and to such adapted specialty crops as sweet corn and potatoes. Irrigation is necessary for optimum yields. Management practices should include the return of large amounts of crop residue to improve available water capacity and the application of fertilizers in moderate amounts at frequent intervals. Unless these soils are irrigated, early-planted crops that mature before the normal dry season will yield best.

Early pasture on these soils provides a good supply for forage, but growth is retarded in summer by the reduced amount of available water.

CAPABILITY UNIT IVe-1

This capability unit consists of moderately well drained, sloping soils that formed mostly in clayey glacial till. These soils have a surface layer of silt loam. Some of these soils are moderately eroded. These soils have a moderately deep root zone, slow to very slow permeability, and a moderate available water capacity. They have moderately low productivity potential.

A very severe hazard of erosion is the major limitation of these soils. They can be tilled over a narrow range of moisture content. They become cloddy if tilled when wet, and they are subject to compaction if tilled or pastured when wet.

These soils are poorly suited to row crops, but row crops can be grown occasionally if a pasture or hayfield is to be reseeded. The soils are well suited to most of the pasture and hay plants commonly grown in the county. Because of the limited depth to which taproots can penetrate and because of the damage of frost heaving, they are only moderately well suited to alfalfa and other legumes that have a taproot. An adequate cover of plants is needed to protect pastures from erosion.

CAPABILITY UNIT IVe-2

This capability unit consists of moderately well drained or well drained, moderately steep, and moderately eroded soils that formed in lacustrine silt and clay or loam glacial till on terraces or uplands. Some of the soils are underlain by bedrock at a depth of 20 to 40 inches. Most of these soils have a moderately deep to deep root zone, moderate permeability, and a moderate to high available water capacity.

A severe hazard of erosion is the major limitation of these soils. Runoff is rapid, and most of the soils are moderately eroded.

These soils are best suited to hay or improved pasture. They can be cultivated occasionally to establish a seeding but are not suited to intense cultivation. Cultivation and seeding should be done on the contour to prevent excessive erosion. Pasturing when wet destroys soil structure, reduces yield of forage, and lowers the quality of plant cover needed for erosion control.

CAPABILITY UNIT IVe-3

This capability unit consists of well drained, moderately steep soils that formed in sand and gravel or in loam glacial till. These soils have a moderately deep to deep root zone, moderately rapid permeability, and a moderate to low available water capacity. They have a low to moderate productivity potential.

A very severe hazard of erosion is the major limitation of these soils. A hazard of drought is also a limitation.

Under optimum management, these soils are suited to most grain and hay crops or pasture plants commonly grown in the county. They are not suited to frequent cultivation, but row crops can be grown occasionally. The soils are best suited to hay and pasture plants seeded with a small grain. Because of the limited available water capacity, most plants do not grow well late in summer and yields are reduced. Drought resistant grasses and legumes should be included in the seeding mixture.

An adequate cover of plants is needed in pastures to protect the soils from erosion.

CAPABILITY UNIT IVe-4

Rittman silt loam, 12 to 18 percent slopes, moderately eroded, is the only soil in this capability unit. It is a moderately steep, medium textured, moderately well drained soil that formed in till on upland positions. It has a dense, compact fragipan in the lower part of the subsoil which restricts water and air movement and root penetration. This soil has a moderately deep root zone, slow permeability, and a moderate available water capacity. It has a low to medium productivity potential. Most areas of this soil are moderately eroded. Runoff is rapid, and the volume of runoff in-

creases if the soil material above the fragipan is saturated.

The hazard of erosion is very severe. Maintenance of fertility, good soil structure, and content of organic matter is a concern if this soil is cultivated.

This soil is well suited to most pasture and hay plants commonly grown in the county. Seeding of these plants is best accomplished by seeding them with a small grain. This soil is not suited to frequent cultivation, but row crops can be grown occasionally if erosion is controlled. Cultivation and seeding should be done on the contour to prevent excessive erosion. An adequate cover of plants is needed in pastures and hayfields to control erosion.

CAPABILITY UNIT IVw-1

This capability unit consists of nearly level to depressional, poorly drained soils that have a surface layer of silt loam and a subsoil of clay. These soils have a moderately deep root zone, very slow permeability, and a moderate available water capacity. They have a low productivity potential. Runoff is slow, and depressional areas are ponded for extensive periods.

Excessive wetness that is difficult to correct is the major limitation to use of these soils. Surface drainage is needed for satisfactory production of adapted grain and forage crops. Diversions can often be used at the base of adjacent slopes to reduce runoff onto these soils. Removal of excess internal water is difficult because these soils are poorly suited to tile drains. Other management concerns include maintenance of good soil structure and an adequate fertility level. These soils dry out more slowly than the surrounding soils, and they are often cultivated or pastured when too wet. The resulting compaction and destruction of soil structure make the soils more difficult to cultivate and reduce yields of both field crops and pasture.

These soils are moderately well suited to some of the grain and hay crops or pasture plants commonly grown in the county. Optimum management is necessary if they are cultivated. Seedings should include grasses and legumes that will tolerate some wetness.

CAPABILITY UNIT VIe-1

This capability unit includes moderately steep to steep, moderately well drained soils that have a surface layer of silt loam. These soils are moderately eroded. They have a moderately deep root zone, slow to very slow permeability, and a moderate available water capacity. Because of the slow permeability, runoff is rapid.

A very severe hazard of erosion makes these soils very poorly suited to cultivated crops. An adequate cover of plants is needed in pastures and hayfields to protect the soils from erosion. These soils are only moderately well suited to alfalfa and other deep-rooted legumes, but they are suited to other grasses and legumes commonly grown for hay or pasture. Grazing should be limited in spring to prevent compaction when the soils are wet.

CAPABILITY UNIT VIe-2

This capability unit consists of well drained, moderately steep to very steep, mostly moderately eroded soils. These soils have a moderately deep to deep root zone, moderate to rapid permeability, and a low or moderate available water capacity. They have a low productivity potential.

The hazard of erosion is very severe. There is a severe limitation to the use of heavy equipment if slopes are more than 25 percent.

These soils are suited to pasture if a dense cover of plants is maintained to protect them from erosion. They are also suited to woodland. They are unsuited to cultivated crops.

CAPABILITY UNIT VIIe-1

This capability unit consists of steep to very steep soils that have a surface layer of loam. The hazard of erosion is very severe, and some areas of these soils are subject to slippage. These soils have a moderately deep to deep root zone, moderately slow to very slow permeability, and a moderate to high available water capacity.

Steepness and a very severe hazard of erosion limit the use of these soils to pasture, woodland, or wildlife habitat. An adequate cover of plants is needed in pastures to protect the soils from erosion. The carrying capacity of pastures is generally low. The soils are suitable for adapted tree species and a variety of plants that can be used for erosion control. They are also suited to upland wildlife habitat.

CAPABILITY UNIT VIIe-2

This capability unit consists of well drained, very steep soils. These soils have a moderately deep to deep root zone, moderate to rapid permeability, and a moderate to low available water capacity.

The hazard of erosion is severe if the soils are not protected by a permanent plant cover. There is also a drought hazard. Slope, shallowness to bedrock, and surface stones limit the use of these soils to pasture, woodland, or wildlife habitat. Some areas can be seeded to improve varieties of adapted grasses and legumes. An adequate cover of plants is needed in pastures to protect the soils from erosion. The carrying capacity of pastures is generally low. They are suitable for adapted tree species and a variety of plants that can be used for erosion control. They are suited to upland wildlife habitat.

Estimated Yields

Table 1 shows, for the arable soils in Portage County, the estimated average yields per acre of principal crops. The yields are the average of those expected over a period of years under prevailing improved and optimum management. Yields are not estimated for strip mines, urban land, and soil-urban land complexes. These areas are not used for farming.

In table 1, yields in column A are those obtained under prevailing improved management, and those in column B are obtained under optimum management. An optimum level of management includes: using practices that increase the intake of water and the water-holding capacity of the soils; disposing of excess water by appropriate means; using practices that help control erosion; using suitable methods of plowing, preparing the seedbed, and cultivating; controlling weeds, diseases, and insects; maintaining fertility and

TABLE 1.—*Estimated average yields per acre of principal crops*

[Figures in columns A indicate yields under prevailing improved management; figures in columns B indicate yields under optimum management. Absence of figure indicates that the crop is not suited to the soil or that it is not commonly grown]

Soil name	Corn		Wheat		Oats		Grass-legume hay		Rotation pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*AUD* [1]	*AUD* [1]
Bogart silt loam, 0 to 2 percent slopes	86	100	36	46	60	80	2.8	3.8	140	190
Bogart silt loam, 2 to 6 percent slopes	84	100	34	46	60	80	2.8	3.8	140	190
Bogart-Haskins complex, 2 to 6 percent slopes	84	100	34	46	60	80	2.8	3.8	140	190
Canadice silt loam	68	88	28	34	52	78	2.0	3.0	100	150
Caneadea silt loam, 0 to 2 percent slopes	72	92	30	36	54	70	2.2	3.2	110	160
Caneadea silt loam, 2 to 6 percent slopes	74	94	32	38	58	72	2.2	3.2	110	160
Canfield silt loam, 0 to 2 percent slopes	88	112	38	52	62	80	3.0	4.6	150	230
Canfield silt loam, 2 to 6 percent slopes	86	110	38	52	62	80	3.0	4.6	150	230
Canfield silt loam, 6 to 12 percent slopes	82	108	36	50	60	78	2.8	4.4	140	220
Canfield silt loam, 6 to 12 percent slopes, moderately eroded	82	106	36	50	60	78	2.8	4.4	140	220
Carlisle muck	85	130	—	—	—	—	—	—	—	—
Chili loam, 0 to 2 percent slopes	62	90	28	38	54	70	3.0	3.8	150	190
Chili loam, 2 to 6 percent slopes	60	88	26	38	52	68	2.8	3.6	140	180
Chili loam, 6 to 12 percent slopes	56	88	24	34	50	66	2.6	3.4	130	170
Chili gravelly loam, 6 to 12 percent slopes, moderately eroded	54	82	22	32	48	64	2.6	3.4	130	170
Chili silt loam, 0 to 2 percent slopes	66	96	30	40	56	74	3.0	3.8	150	190
Chili silt loam, 2 to 6 percent slopes	62	92	28	38	54	72	2.8	3.6	140	180
Chili silt loam, 6 to 12 percent slopes	58	88	26	36	52	68	2.6	3.4	130	170
Chili-Oshtemo complex, 12 to 18 percent slopes	—	—	—	—	—	—	2.4	3.2	120	160
Chili-Oshtemo complex, 18 to 25 percent slopes	—	—	—	—	—	—	2.2	3.0	110	150
Chili-Oshtemo complex, 25 to 50 percent slopes	—	—	—	—	—	—	1.8	2.4	90	120
Chili-Wooster complex, 6 to 12 percent slopes, moderately eroded	58	90	26	36	52	68	2.8	3.6	140	180
Chili-Wooster complex, 12 to 18 percent slopes, moderately eroded	56	88	24	34	50	66	2.4	3.4	120	170
Chili-Wooster complex, 18 to 30 percent slopes	—	—	—	—	—	—	2.4	3.2	120	160
Damascus loam	72	92	32	38	62	72	2.2	3.2	110	160
Dekalb channery loam, 2 to 6 percent slopes	72	90	32	40	50	62	2.5	3.6	120	180
Dekalb channery loam, 6 to 12 percent slopes	70	88	30	38	48	60	2.2	3.4	110	170
Dekalb channery loam, 12 to 25 percent slopes	—	—	—	—	—	—	2.0	3.0	100	150
Dekalb channery loam, 25 to 70 percent slopes	—	—	—	—	—	—	—	—	50	100
Ellsworth silt loam, 2 to 6 percent slopes	82	106	36	48	58	76	2.8	4.4	140	220
Ellsworth silt loam, 2 to 6 percent slopes, moderately eroded	80	98	34	46	56	74	2.6	4.2	130	210
Ellsworth silt loam, 6 to 12 percent slopes	80	96	34	46	56	74	2.6	4.2	130	210
Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded	74	94	28	42	50	70	2.4	4.0	120	200
Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded	—	—	—	—	—	—	2.4	3.4	120	170
Ellsworth silt loam, 18 to 40 percent slopes, moderately eroded	—	—	—	—	—	—	—	—	50	100
Ellsworth silt loam, sandstone substratum, 2 to 6 percent slopes	80	98	34	46	56	74	2.6	4.2	130	210
Fitchville silt loam, 0 to 2 percent slopes	72	98	30	40	56	74	2.2	3.2	110	160
Fitchville silt loam, 2 to 6 percent slopes	72	98	30	40	56	74	2.2	3.2	110	160
Frenchtown silt loam	70	92	30	36	60	70	2.0	3.0	100	150
Geeburg silt loam, 2 to 6 percent slopes	72	92	32	40	56	74	2.2	3.2	110	160
Geeburg silt loam, 2 to 6 percent slopes, moderately eroded	70	90	30	38	54	72	2.2	3.2	110	160
Geeburg silt loam, 6 to 12 percent slopes, moderately eroded	68	88	28	36	52	70	2.0	3.0	100	150
Geeburg silt loam, 12 to 18 percent slopes, moderately eroded	—	—	—	—	—	—	1.6	2.4	80	120
Geeburg and Glenford silt loams, steep	—	—	—	—	—	—	—	—	50	100
Glenford silt loam, 0 to 2 percent slopes	88	112	40	54	64	82	3.2	4.8	160	240
Glenford silt loam, 2 to 6 percent slopes	86	110	38	42	62	80	3.0	4.6	150	230
Glenford silt loam, 6 to 12 percent slopes, moderately eroded	84	106	36	50	60	78	3.0	4.6	150	230
Glenford silt loam, 12 to 18 percent slopes, moderately eroded	50	80	28	40	50	66	2.8	4.2	140	210

See footnote at end of table.

TABLE 1.—*Estimated average yields per acre of principal crops*—Continued

Soil name	Corn		Wheat		Oats		Grass-legume hay		Rotation pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*AUD* [1]	*AUD* [1]
Haskins loam, 2 to 6 percent slopes	88	108	30	46	62	74	3.4	4.4	170	220
Holly silt loam	70	90	20	30	40	65	2.2	3.2	110	160
Hornell silt loam, 3 to 8 percent slopes	60	80	24	32	42	60	1.4	2.4	70	120
Jimtown loam, 0 to 2 percent slopes	74	98	32	36	62	72	2.2	3.2	110	160
Jimtown loam, 2 to 6 percent slopes	74	98	32	38	62	74	2.2	3.2	110	160
Lakin loamy sand, 2 to 6 percent slopes	50	80	20	34	40	66	2.0	3.4	100	170
Lakin loamy sand, 6 to 12 percent slopes	46	76	20	32	36	60	2.0	3.4	100	170
Linwood muck	86	115								
Lorain silty clay loam	86	110	30	42	50	68	2.8	4.6	140	230
Loudonville silt loam, 2 to 6 percent slopes	82	102	38	50	60	74	2.8	4.0	140	200
Loudonville silt loam, 6 to 12 percent slopes	80	102	36	48	58	72	2.8	4.0	140	200
Loudonville silt loam, 6 to 12 percent slopes, moderately eroded	80	100	36	48	58	72	2.8	4.0	140	200
Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	78	92	34	46	56	70	2.6	3.8	130	190
Loudonville silt loam, 18 to 25 percent slopes			30	40	35	60	2.4	3.6	130	180
Mahoning silt loam, 0 to 2 percent slopes	70	90	30	40	54	70	2.4	3.6	120	180
Mahoning silt loam, 2 to 6 percent slopes	72	94	30	40	54	72	2.4	3.6	120	180
Mitiwanga silt loam, 0 to 2 percent slopes	74	90	30	40	60	70	3.2	4.0	160	200
Mitiwanga silt loam, 2 to 6 percent slopes	72	94	28	36	56	64	3.0	3.6	150	180
Mitiwanga silt loam, moderately well drained variant, 2 to 6 percent slopes	74	98	26	44	52	68	3.2	3.8	160	190
Mitiwanga silt loam, moderately well drained variant, 6 to 12 percent slopes	74	94	24	42	50	66	3.0	3.6	150	180
Olmsted loam	94	130	34	48	64	76	3.2	5.0	160	250
Orrville silt loam	84	104	30	40	58	70	2.8	4.4	140	220
Oshtemo sandy loam, 2 to 6 percent slopes	60	80	22	34	50	68	2.6	3.6	130	180
Oshtemo sandy loam, 6 to 12 percent slopes	56	74	20	32	46	64	2.2	3.2	110	160
Ravenna silt loam, 0 to 2 percent slopes	84	110	34	44	60	74	3.0	4.6	150	230
Ravenna silt loam, 2 to 6 percent slopes	82	108	32	52	56	70	2.8	4.4	140	220
Remsen silt loam, 0 to 2 percent slopes	78	96	24	30	50	64	2.0	3.0	100	150
Remsen silt loam, 2 to 6 percent slopes	74	94	22	28	48	62	2.0	3.0	100	150
Rittman silt loam, 2 to 6 percent slopes	86	110	38	52	62	80	3.2	4.8	160	240
Rittman silt loam, 6 to 12 percent slopes	84	108	36	50	60	78	3.0	4.6	150	230
Rittman silt loam, 6 to 12 percent slopes, moderately eroded	76	90	28	40	54	68	2.8	4.4	140	220
Rittman silt loam, 12 to 18 percent slopes, moderately eroded							2.0	3.6	100	180
Rittman silt loam, 18 to 25 percent slopes, moderately eroded							2.0	3.0	100	150
Sebring silt loam	66	88	28	34	52	68	2.0	3.0	100	150
Sebring silt loam, dark surface variant	71	110	30	42	54	70	2.8	4.6	140	230
Tioga loam	80	110	36	46	58	76	3.0	4.6	150	230
Trumbull silt loam, 0 to 2 percent slopes	66	88	24	36	60	70	2.0	3.0	100	150
Wadsworth silt loam, 0 to 2 percent slopes	72	92	30	40	54	72	2.4	3.6	120	180
Wadsworth silt loam, 2 to 6 percent slopes	68	90	26	36	50	66	2.4	3.6	120	180
Wallkill silt loam	80	100	36	42	56	80	3.5	4.5	180	230
Wheeling silt loam, 0 to 2 percent slopes	88	112	38	52	56	72	3.0	4.0	150	200
Wheeling silt loam, 2 to 6 percent slopes	86	110	36	50	52	70	3.0	4.0	150	200
Wooster silt loam, 2 to 6 percent slopes	88	112	42	56	66	88	3.4	4.8	170	240
Wooster silt loam, 6 to 12 percent slopes	84	108	40	54	66	86	3.2	4.6	160	230
Wooster silt loam, 6 to 12 percent slopes, moderately eroded	92	106	38	52	64	84	3.0	4.4	150	220
Wooster silt loam, 12 to 18 percent slopes, moderately eroded	50	80	30	46	56	74	2.6	4.0	130	200
Wooster silt loam, 18 to 50 percent slopes, moderately eroded							2.0	3.6	100	180

[1] AUD is animal-unit-days, a term used to express the carrying capacity of pasture. It is the number of days 1 acre can carry 1 animal unit during a single grazing season without injury to the sod. One animal unit is defined as 1 cow, 2 yearling calves, 1 horse, 7 sheep, or 4 brood sows. For example, 4 cows can graze about 25 days in a pasture that has a carrying capacity of 100 animal-unit-days.

the pH content at an optimum level; applying such trace elements as zinc, cobalt, manganese, and copper, if they are needed; selecting high-yielding crop varieties suited to the soil; and completing all farming operations at the proper time and in the proper way.

In an improved level of management the farmer uses some, but not all, of the practices listed under optimum management, or the practices used are not adequate for the needs of crops.

The yields given in table 1 do not apply to a specific field for any particular year because the soils vary from place to place, management practices vary from farm to farm, and weather conditions are variable from year to year. These yields are intended only as a general guide that shows the relative productivity of the soils, the response of the soils to management, and the relationship of the soils to each other. Although the general level of crop yields may change as new methods and new crop varieties are developed, the relative response of the different soils is not likely to change.

The estimated yields given in table 1 are based primarily on information obtained from farmers, and on observations and field trials made by the county agent and by the district conservationist of the Soil Conservation Service. They are also based on experiments made by the Ohio Agricultural Research and Development Center and on field observations made by members of the soil survey party.

Special Crops

Special crops grown for commercial use in Portage County include vegetables, orchards, sod, and some nursery stock. No attempt will be made in this section to give specific practices, fertilization rates, or seeding varieties for these crops. A high level of management is needed to successfully produce these crops. More complete information can be obtained from the Ohio Cooperative Extension Service or the Soil Conservation Service.

The investment in labor and machinery, and the other costs of growing special crops, are generally higher than for general farm crops. The high value of the special crops makes the use of good soil management and cultural practices a necessity.

Such vegetables as onions, lettuce, celery, and radishes are grown mainly on such organic soils as Carlisle and Linwood muck. Carlisle, Canfield, Chili, and Wooster soils are used for potatoes. The muck soils are slow to warm up in spring, are subject to frost, and generally require liberal applications of potash fertilizer. Erosion control is a problem on most soils used for potatoes.

Apples are the major orchard crop in the county. Most of the orchards are at the higher elevations on sloping soils or on higher grounds adjacent to lakes where air drainage is good. Canfield, Chili, Ellsworth, and Mahoning soils are mainly used for orchards; however, the fragipan in the subsoil of the Canfield soils and the firm subsoil and substratum of Ellsworth and Mahoning soils hinder proper root development. Erosion control is important on these sloping soils.

Sod is most commonly grown on Carlisle soils. Drainage is needed to lower the water table and to reduce the length of time that these soils are ponded after rains. Ponding causes the sod to turn yellow, weed seeds to be floated in, and trafficability to be reduced. Soils that have a thick, highly organic surface layer and that are properly drained are well suited to sod production.

Irrigation

Rainfall in Portage County generally is adequate for most crops, but it is not always timely or well distributed. Extended dry periods sometimes occur between June and September.

Many soils in the county are suited to irrigation and can be profitably irrigated if water is available. Features that affect the suitability of a soil for irrigation are available water capacity, slope, water-intake rate, need for drainage, depth of soil as it relates to the root depth, susceptibility to stream flooding, hazard of erosion, and presence of a fragipan or other layers that limit water movement. Soils that have slopes of more than 6 percent are highly susceptible to erosion if they are irrigated.

Soils that are best suited to irrigation have been placed in five groups according to their suitability for sprinkler irrigation. Soils not listed are generally steep enough to make erosion control difficult if they are irrigated.

IRRIGATION GROUP 1

This irrigation group consists of the nearly level or gently sloping, well drained, and permeable Chili, Lakin, Oshtemo, and Wheeling soils. These soils are in stream valleys where adequate water is most likely to be obtained from streams or from underground aquifers. They can safely be irrigated if erosion control practices are used where slopes are 2 to 6 percent. Generally, the soils absorb rainwater that falls immediately after irrigation. Because the available water capacity is lower in Chili, Lakin, and Oshtemo soils, irrigation is required more often on these soils than on the Wheeling soils.

IRRIGATION GROUP 2

This irrigation group consists of nearly level or gently sloping, well drained Loudonville and Wooster soils. These soils have moderate permeability, and most have a moderate available water capacity. Erosion control practices are needed where slopes are 2 to 6 percent. Loudonville soils are more droughty than Wooster soils.

IRRIGATION GROUP 3

This irrigation group consists of nearly level or gently sloping, moderately well drained, and moderately rapidly permeable to very slowly permeable Bogart, Canfield, Ellsworth, Geeburg, Glenford, and Rittman soils. These soils mostly have a moderate to high available water capacity, but in some of the soils root penetration is limited by a dense, compact fragipan.

IRRIGATION GROUP 4

The soils in this group are in the Canadice, Caneadea, Damascus, Fitchville, Frenchtown, Haskins, Holly, Hornell, Jimtown, Lorain, Mahoning, Mitiwanga, Olm-

sted, Orrville, Ravenna, Remsen, Sebring, Trumbull, and Wadsworth series.

These soils are nearly level or gently sloping, very poorly drained to somewhat poorly drained, and moderately permeable to very slowly permeable. Severe wetness is a limitation of some of the soils. These soils are difficult to drain, but they should be drained artificially before they are irrigated. If heavy rain falls after irrigation, the soils may be so wet that plant growth is retarded and fieldwork delayed. Erosion control practices should be used where the slope ranges from 2 to 6 percent.

IRRIGATION GROUP 5

In this irrigation group are level or nearly level, very poorly drained Carlisle, Linwood, and Wallkill soils. These soils have a high water table that must be lowered before crops can be grown. These are the only soils in the county that are also suited to subterranean irrigation. They can be subirrigated by using gates that control the level of water in the drainage ditch.

Woodland

The original plant cover in Portage County was a dense cover of hardwood trees. Cutting for commercial purposes and clearing for farmland essentially eliminated these virgin stands. Now the woodlands consist of second- and third-growth stands (fig. 2).

Approximately 89,000 acres, or 28 percent of the county, remains in woodland, according to the 1971 Ohio Soil and Water Conservation Needs Inventory. Most of this acreage is scattered throughout the county in small woodlots.

The existing kinds of trees are similar to those of the original forests, which were mainly beech, maple, oak, hickory, and poplar trees. Most of the soils in the county have potential for growing productive woodlands of commercial value.

The soils of Portage County have been placed in woodland suitability groups to assist owners in planning the use of their soils for wood crops. Each group is made up of soils that are suited to the same kinds of trees, that need about the same management, and that have the same potential production.

Each woodland group is identified by a three-part symbol, such as 1o1, 2w1, or 3r2. The potential productivity class of the soils in the group is indicated by the first number in the symbol: 1 indicates excellent, 2 indicates good, and 3 indicates fair. These ratings are based on field determination of average site index. Site index of a given soil is the height, in feet, that the dominant and co-dominant trees reach in a natural, essentially unmanaged stand in 50 years. Site index can be converted into approximate expected growth and yield per acre in cords and board feet (*5, 7*).[1]

Table 2 gives the potential productivity of the soils in each woodland group for selected kinds of trees. Both the estimated site index and the adjective rating are given.

The second part of the symbol identifying a woodland group is a small letter. In this survey *w, c, s, r,* and *o* are used. Except for the *o*, the small letter indicates

[1] Italic numbers in parenthesis refer to Literature Cited, p. 111.

Figure 2.—**Outcrops of bedrock are common on Dekalb soils. These soils are suited to woodland.**

an important soil property that imposes a hazard or limitation in managing the soils of the group for trees. The letter *o* shows that the soils have few limitations that restrict their use for trees. The letter *w* indicates excessive wetness, either seasonal or all year. The soils have restricted drainage, have a high water table, or are subject to flooding. The letter *c* indicates that the main limitation is the kind or amount of clay in the upper part of the soil. The letter *s* stands for sandy soils that have little or no difference in texture between surface layer and subsoil. These soils are moderately to severely restricted for woodland use. They have low available water capacity and are low in available plant nutrients. The letter *r* indicates that the main limitation is steep slopes and that there is a hazard of erosion and possibly limitations to use of equipment. In Portage County *r* is used if slopes are more than 12 percent. Priority in assigning a letter to the soils is *w, c, s, r,* and *o*.

The last part of the symbol, another number, differentiates woodland suitability groups that have identical first and second parts in their identifying symbol. Timber on soils in woodland group 2w1, for example, requires somewhat different management than timber on soils in group 2w2.

In table 2 each woodland suitability group in the

TABLE 2.—*Woodland*

[Typic Udorthents, strip mined (TUB, TUD), Urban land (Ur), and the Urban land complexes (CfB, CfC, CuB, CuC, EuB, FnA, GcB, are not suited to commercial

Woodland suitability groups and mapping units	Potential productivity			Management limitations	
	Kinds of trees	Estimated site index	Rating	Erosion hazard	Equipment limitations
		Feet			
Group 1o1: CdA, CdB, CdC, CdC2, GfA, GfB, GfC2, RsB, RsC, RsC2, Tg, WhA, WhB, WuB, WuC, WuC2.	Upland oak Yellow-poplar Sugar maple	80–95 95+ 95+	Excellent	Slight	Slight
Group 1r1: GfD2, RsD2, RsE2, WuD2	Upland oak	85–95	Excellent	Moderate	Moderate
Group 1r2: WuE2	Upland oak	85–95	Excellent	Severe	Severe
Group 2o1: BgA, BgB, BhB, CnA, CnB, CnC, CoC2, CpA, CpB, CpC, CwC2, LoB, LoC, LoC2.	Upland oak	75–85	Good	Slight	Slight
Group 2r1: CwD2, CwE, LoD2, LoE	Upland oak	75–85	Good	Moderate	Moderate
Group 2w1: Ca, Ln, Od, Sv, Wc	Pin oak	80–90	Good	Slight	Severe
Group 2w2: Da, Fr, Ho, Sb, TrA	Pin oak Upland oak Yellow-poplar Sugar maple Eastern white pine	80–90 75–85 85–95 75–85 85–95	Good	Slight	Severe
Group 2w3: CcA, CcB, FcA, FcB, HaB, JtA, JtB, MgA, MgB, Or, ReA, ReB, RmA, RmB, WaA, WaB.	Upland oak Pin oak Yellow-poplar Sugar maple Eastern white pine	75–85 80–90 85–95 75–85 85–95	Good	Slight	Moderate
Group 2c1: GbB, GbB2, GbC2	Upland oak	75–85	Good	Slight	Moderate
Group 2c2: GbD2	Upland oak	75–85	Good	Moderate	Severe
Group 2c3: GEF	Upland oak	75–85	Good	Severe	Severe
Group 3o1: DkB, DkC, ElB, ElB2, ElC, ElC2, EsB, MvB, MvC.	Upland oak	65–75	Fair	Slight	Slight
Group 3r1: DkD, ElD2, ElE2	Upland oak	65–75	Fair	Moderate	Moderate
Group 3r2: DkF	Upland oak	65–75	Fair	Severe	Severe

interpretations

MnB) are not included because they are too variable; Carlisle muck (Cg) and Linwood muck (Ld) are not included because they tree production]

Management limitations—Continued				Kinds of trees	
Seedling mortality	Plant competition		Windthrow hazard	To favor in existing stands	Suitable for planting
	Conifers	Hardwoods			
Slight	Severe	Moderate	Slight	Northern red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut, and black cherry.	Eastern white pine, yellow-poplar, black walnut, and Norway spruce.
Slight	Severe	Moderate	Slight	Northern red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut, and black cherry.	Eastern white pine, yellow-poplar, and black walnut.
Slight	Severe	Moderate	Slight	Northern red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut, and black cherry.	Eastern white pine, yellow-poplar, and black walnut.
Slight	Severe	Moderate	Slight	Northern red oak, white oak, yellow-poplar, white ash, black walnut, and sugar maple.	Eastern white pine, yellow-poplar, and black walnut.
Slight	Severe	Moderate	Slight	Northern red oak, white oak, yellow-poplar, white ash, black walnut, and sugar maple.	Eastern white pine, yellow-poplar, and black walnut.
Severe	Severe	Severe	Severe	Pin oak, white ash, and red maple.	Natural seeding.
Moderate	Severe	Severe	Moderate	Yellow-poplar, pin oak, black oak, white ash, sugar maple, and red maple.	Eastern white pine, and yellow-poplar.
Slight	Moderate	Severe	Slight	Northern red oak, yellow-poplar, white ash, sugar maple, red maple, and pin oak.	Eastern white pine, Norway spruce, and white spruce.
Slight	Severe	Moderate	Slight	Northern red oak, and white ash.	Eastern white pine, and yellow-poplar.
Slight	Severe	Moderate	Slight	Northern red oak, and white ash.	Eastern white pine, and yellow-pine.
Slight	Severe	Moderate	Slight	Northern red oak, and white ash.	Eastern white pine, and yellow-poplar.
Slight	Moderate	Slight	Slight	Northern red oak, white oak, white ash, and yellow-poplar.	Eastern white pine, and yellow-poplar.
Slight	Moderate	Slight	Slight	Northern red oak, and white oak.	Eastern white pine, and yellow-poplar.
Slight	Moderate	Slight	Slight	Northern red oak, and white oak.	Eastern white pine, and yellow-poplar.

TABLE 2.—*Woodland*

Woodland suitability groups and mapping units	Potential productivity			Management limitations	
	Kinds of trees	Estimated site index	Rating	Erosion hazard	Equipment limitations
		Feet			
Group 3w1: HrB, MtA, MtB	Upland oak Pin oak Yellow-poplar Sugar maple	65–75 70–80 75–85 65–75	Fair	Slight	Moderate
Group 3s1: LaB, LaC, OsB, OsC	Upland oak	65–75	Fair	Slight	Slight
Group 3s2: CtD, CtE	Upland oak	65–75	Fair	Moderate	Moderate
Group 3s3: CtF	Upland oak	65–75	Fair	Severe	Severe

county is rated for various management hazards or limitations of the soils. Ratings are slight, moderate, or severe, and they are described in the following paragraphs.

Erosion hazard refers to the potential hazard of soil losses through erosion in common woodland management operations. The hazard is *slight* if expected soil losses are small; *moderate,* if some soil losses are expected and care is needed during logging and construction to reduce soil losses; and *severe,* if special methods of operation are necessary for preventing excessive soil loss.

Equipment limitations depend on soil characteristics that restrict or prohibit the use of harvesting equipment, either seasonally or continually. A *slight* limitation means serious restrictions in the kind of equipment or time of year it is used. *Moderate* means that use of equipment is restricted for 3 months of the year or less. *Severe* means that special equipment is needed and that its use is severely restricted for more than 3 months of the year.

Seedling mortality refers to mortality of naturally occurring or planted tree seedlings, as influenced by kinds of soil or topographic conditions when plant competition is assumed not to be a factor. *Slight* means a loss of 0 to 25 percent. *Moderate* means a loss of 25 to 50 percent. *Severe* means a loss of more than 50 percent of the seedlings. It is assumed that seed supplies are adequate.

Plant competition is the degree to which undesirable plants invade openings in the tree canopy. A *slight* limitation means that plant competition does not prevent adequate natural regeneration and early growth or interfere with seedling development. *Moderate* means that competition delays natural or artificial establishment and growth rate, but does not prevent the development of fully stocked normal stands. *Severe* means that competition prevents adequate natural or artificial regeneration unless the site is prepared properly and proper maintenance practices are used.

Windthrow hazard depends on the soil characteristics that enable trees to resist being blown down by wind. *Slight* means that most trees withstand the wind. *Moderate* means that some trees are expected to blow down during excessive wetness and high wind. *Severe* means that many trees are expected to blow down during periods when the soil is wet and winds are moderate or high.

Table 2 also lists suitable kinds of plants to favor in existing stands and suitable kinds for planting.

The woodland suitability group to which each soil is assigned is given in the "Guide to Mapping Units" at the back of this survey and at the end of the description of that soil in the section, "Descriptions of the Soils."

Wildlife

The kinds of wildlife that live in a given area, the number of each kind, and their survival and extent depend on the presence and distribution of water and of plants that provide food and cover. If any of these habitat elements is lacking or inadequate, desired wildlife will be absent or scarce. These elements of wildlife habitat are closely related to kinds of soil.

Most wildlife habitat is created or improved by planting suitable vegetation, manipulating existing vegetation to increase or improve desirable plants, or by a combination of these measures. For this management, a knowledge of the soils is needed so that plants suitable for wildlife can be established. Water areas also can be established or improved for wetland wildlife. Specific information about managing wildlife areas can be obtained from the Cooperative Extension Service or the Soil Conservation Service.

In table 3, most of the soils of Portage County are rated according to their suitability for seven elements of wildlife habitat and for three broad classes of wildlife (*1*).

This information can be used to aid in—

interpretations—Continued

Management limitations—Continued				Kinds of trees	
Seedling mortality	Plant competition		Windthrow hazard	To favor in existing stands	Suitable for planting
	Conifers	Hardwoods			
Slight	Moderate	Severe	Slight	Northern red oak, yellow-poplar, white ash, sugar maple, red maple, and pin oak.	Eastern white pine, Norway spruce, and white spruce.
Moderate	Moderate	Slight	Slight	Northern red oak, and white oak.	Eastern white pine, and red pine.
Moderate	Moderate	Slight	Slight	Northern red oak, and white oak.	Eastern white pine, and red pine.
Moderate	Moderate	Slight	Slight	Northern red oak, and white oak.	Eastern white pine, and red pine.

1. Broad-scale planning for wildlife land use, such as in parks, wildlife refuges, and nature-study areas.
2. Selecting the better sites for creating, improving, or maintaining specific kinds of wildlife habitat.
3. Determining the relative degree of management required for individual habitat elements.
4. Eliminating sites on which management for specific kinds of wildlife is difficult or not feasible.
5. Determining areas suitable for acquisition for wildlife use.

Each soil is rated in table 3 according to its suitability for various kinds of plants and other elements that make up a wildlife habitat. Not considered in the ratings are the present land use, the location of a soil in relation to other soils, and the mobility of wildlife. All of the soils are rated on the basis of their natural drainage class. Artificial drainage can change the ratings indicated.

The seven elements considered important are as follows:

Grain and seed crops.—These crops include such seed-producing annuals as corn, sorghum, wheat, barley, rye, oats, millet, sunflowers, and other plants commonly grown for grain or for seed. The major soil properties affecting this habitat element are effective root depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer.

Grasses and legumes.—Domestic perennial grasses and herbaceous legumes that are established by planting and furnish wildlife cover and food make up this group. Among the plants are bluegrass, fescue, bromegrass, timothy, orchardgrass, reed canarygrass, clover, and alfalfa. The major soil properties affecting this habitat element are effective root depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer.

Wild herbaceous plants.—In this group are native or introduced perennial grasses and some weeds that generally are established naturally. They include bluestem, foxtail, ragweed, wildrye, goldenrod, wild carrot, nightshade, dandelion, and native lespedeza. These plants provide food and cover principally to upland wildlife. Major soil properties affecting this habitat element are effective root depth, available water capacity, natural drainage, surface stoniness, hazard of flooding or ponding, and texture of the surface layer.

Hardwood trees.—This element includes nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage for wildlife. These trees and shrubs generally are established naturally but in places are planted. Among the native species are oak, cherry, maple, beech, hackberry, apple, hawthorn, dogwood, persimmon, sumac, sassafras, hazelnut, black walnut, hickory, blackgum, blackhaw, viburnum, grape, and briers. The major soil properties affecting this habitat element are effective root depth, available water capacity, and natural drainage.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Autumn-olive, Amur honeysuckle, Tatarian honeysuckle, crabapple, multiflora rose, highbush cranberry, and silky dogwood are some of the shrubs that generally are available and can be planted on soils that are rated good. Hardwoods not available commercially can commonly be transplanted successfully.

Coniferous plants.—This element consists of cone-bearing evergreen trees and shrubs that are used by wildlife primarily as cover, though they also provide browse and seed or fruitlike cones. Among them are Norway spruce, Virginia pine, shortleaf pine, Scotch pine, and eastern redcedar. The major soil properties

TABLE 3.—*Wildlife*

[Typic Udorthents, strip mined (TUB, TUD), Urban land (Ur), and the Urban land complexes (CfB, CfC, CuB, CuC, EuB, FnA, GcB, MnB) are not included because they are too variable to rate]

Soil series and map symbols	Suitability of soils for elements of wildlife habitat: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Suitability of soils for—: Openland wildlife	Woodland wildlife	Wetland wildlife
Bogart:										
BgA	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
BgB	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Bogart-Haskins: BhB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Canadice: Ca	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Caneadea:										
CcA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CcB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Canfield:										
CdA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CdB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CdC, CdC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Carlisle muck: Cg	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Chili: CnA, CnB, CnC, CoC2, CpA, CpB, CpC.	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Chili-Oshtemo:										
CtD, CtE	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
CtF	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Chili-Wooster:										
CwC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CwD2, CwE	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Damascus: Da	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Dekalb:										
DkB, DkC	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

DkD	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
DkF	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Ellsworth:										
ElB, ElB2	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElC, ElC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ElD2	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ElE2	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ellsworth, sandstone substratum: EsB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Fitchville:										
FcA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FcB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Frenchtown: Fr	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Geeburg:										
GbB, GbB2	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
GbC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GbD2	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Geeburg and Glenford, steep: GEF	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Glenford:										
GfA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
GfB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GfC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GfD2	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Haskins: HaB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Holly: Ho	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Hornell: HrB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Jimtown:										
JtA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
JtB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

TABLE 3.—*Wildlife*—Continued

Soil series and map symbols	Suitability of soils for elements of wildlife habitat: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Suitability of soils for—: Openland wildlife	Woodland wildlife	Wetland wildlife
Lakin: LaB, LaC	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Linwood: Ld	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Lorain: Ln	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Loudonville:										
LoB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC, LoC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoD2, LoE	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mahoning:										
MgA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MgB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mitiwanga:										
MtA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MtB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mitiwanga variant:										
MvB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MvC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Olmsted: Od	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Orrville: Or	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Oshtemo: OsB, OsC	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Ravenna:										
ReA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
ReB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Remsen:										
RmA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RmB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

Rittman:										
RsB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RsC, RsC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RsD2, RsE2	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Sebring: Sb	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Sebring variant: Sv	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Tioga: Tg	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Trumbull: TrA	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wadsworth:										
WaA	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WaB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wallkill: Wc	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wheeling: WhA, WhB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wooster:										
WuB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WuC, WuC2	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WuD2	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WuE2	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

affecting this habitat element are effective root depth, available water capacity, and natural drainage.

Wetland plants.—This element consists of wild, herbaceous, annual and perennial plants that grow on moist to wet sites exclusive of submerged or floating aquatics. These plants produce food and cover used mainly by wetland forms of wildlife. They include smartweed, wild millet, bulrush, sedges, barnyardgrass, pondweed, arrowarum, pickerelweed, and cattails. The major soil properties affecting this habitat element are natural drainage, surface stoniness, slope, and texture of the surface layer.

Shallow water areas.—These are areas of shallow water, generally not exceeding 5 feet in depth, near food and cover for wetland wildlife. They may be natural wet areas, or those created by dams or levees, or created by water-control devices in marshes or streams. Examples of such developments are wildlife ponds, beaver ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments. Major soil properties affecting this habitat element are depth to bedrock, natural drainage, slope, surface stoniness, and permeability. Natural wet areas that are aquifer-fed are rated on the basis of drainage class without regard to permeability. Permeability of the soil would apply only for those non-aquifer areas with a potential for development, and water is assumed to be available offsite.

Table 3 also rates the soils according to their suitability for three general kinds of wildlife habitat in the county—openland, woodland, and wetland wildlife.

Openland wildlife.—Examples of openland wildlife are bobwhite quail, ringneck pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals prefer habitat in areas of cultivated crops, pasture, meadow, and lawns and in areas overgrown with grasses, herbs, shrubs, and vines. They also use areas along the fence lines and borders near openland.

Woodland wildlife.—Among the birds and mammals that prefer woodland habitat are ruffed grouse, turkey, woodcock, thrush, vireo, scarlet tanager, red, gray, and fox squirrels, red and gray foxes, opposum, white-tailed deer, and raccoon. They obtain food and cover in stands of hardwoods, coniferous trees, shrubs, or a mixture of these plants.

Wetland wildlife.—Ducks, Canada geese, rails, herons, beaver, and muskrat are familiar examples of birds and mammals that prefer habitat in wet areas, such as ponds, marshes, and swamps.

The ratings of soil suitability for the kinds of wildlife listed in table 3 are based on the ratings for habitat elements given in the table. For openland wildlife the rating is based on the ratings shown for grain and seed crops, domestic grasses and legumes, wild herbaceous upland plants, and either hardwood woody plants or coniferous woody plants, whichever is most applicable. For wetland wildlife the rating is based on the ratings shown for wetland food and cover plants and shallow water areas.

On soils rated *good,* habitat is generally easily created, improved, or maintained. There are few or no soil limitations in habitat management, and satisfactory results are well assured.

On soils rated *fair,* habitat usually can be created, improved, or maintained, but the soils have moderate limitations that affect the creation, improvement, or maintenance of the habitat. A moderate intensity of management and fairly frequent attention may be required to assure satisfactory results.

On soils rated *poor,* habitat can usually be created, improved, or maintained; but there are rather severe soil limitations. Habitat management may be difficult, expensive, and require intensive effort. Satisfactory results are questionable.

On soils rated *very poor,* it is impractical to create, improve, or maintain habitat because of the very severe soil limitations. Unsatisfactory results are probable.

Engineering Uses of the Soils [2]

This section is useful to planning commissions, town and city managers, land developers, engineers, contractors, farmers, and others who need information about soils used as structural material or as a foundation on which structures are built.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the soils on which they are built, to help predict performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 4, 5, and 6. Table 4 shows the results of engineering laboratory tests on soil samples. Table 5 shows estimated soil properties significant to engineering. Table 6 gives interpretations for various engineering uses.

This information, along with the soil map and data in other parts of this publication, can be used to make interpretations in addition to those given in tables 5

[2] TOM JONES, civil engineer, Soil Conservation Service, helped prepare this section.

and 6, and it also can be used to make interpretive maps for specific land uses.

This information, however, does not eliminate the need for further investigation at sites selected for engineering works, especially works that involve heavy loads or that require excavations to a depth greater than those shown in the tables, generally a depth of more than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil include small areas of other kinds of soil that have strongly contrasting properties and different suitability or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning in soil science. The Glossary defines many of these terms.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system used by SCS engineers, the Department of Defense, and others, and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO).

In the Unified system (*3*), soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes, for example, CL–ML.

The AASHTO system (*2*) is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clayey soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 4; the estimated classification, without group index numbers, is given in table 5 for all soils mapped in the survey area.

Test data

Table 4 contains engineering test data for some of the major soil series in Portage County. The tests were made to help evaluate the soils for engineering purposes. Testing was conducted in the Soil Physical Studies Laboratory, Ohio State University, and in the Ohio Department of Highways Testing Laboratory. The engineering classifications are based on data obtained by mechanical analyses and by tests to determine liquid limit and plastic limit. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture contents, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases as moisture content increases. The highest dry density obtained in the compactive test is the maximum dry density. Maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of the soil material, as explained for table 5.

Soil properties significant in engineering

Estimates of several soil properties significant in engineering are given in table 5. These estimates are made for typical soil profiles by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the column headings in table 5.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Depth to bedrock is the distance from the surface of the soil to the rock layer.

Soil texture is described in table 5 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil material contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used are defined in the Glossary.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 5 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of the soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount of water in the soil at the wilting point of most cultivated crops.

Reaction is the degree of acidity or alkalinity of a soil, expressed as pH. The pH value and terms used to describe soil reaction are explained in the Glossary.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of the soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from semisolid to plastic. If the moisture content is further increased, the material changes from plastic to liquid.

TABLE 4.—*Engineering*

[Absence of an entry indicates

Soil name and location	Parent material	Report number	Depth	Moisture-density [2]	
				Maximum dry density	Optimum moisture
			Inches	*Lb. per cu. ft.*	*Percent*
Canadice (PG–11): Ravenna Township; 600 feet south-southeast of the intersection of State Route 88 and by-pass State Route 14; 200 feet east of State Route 88. (Modal)	Lacustrine clay	20440	0–8		
		20441	8–16		
		20442	16–26		
		20443	26–32		
		20444	32–43		
		20445	43–53		
		20446	53–63	107	18
Caneadea (PG–1): Aurora Township; about 4 miles southwest of Aurora, 1,500 feet east of the Summit County line, 200 feet south of Davis Road. (Modal)	Lacustrine clay	36056	23–29	107	18
		36057	57–68	102	20
Canfield (PG–3): Randolph Township; 2 miles northeast of Randolph, 200 feet south of Taylor Road, 500 feet east of New Milford Road. (Modal)	Glacial till	19281	0–8		
		19282	8–11		
		19283	11–16		
		19284	16–22		
		19285	22–30		
		19286	30–38		
		19287	38–46		
		19288	46–59		
		19291	59–69		
Ellsworth (PG–7): Edinburg Township; 1.25 miles northwest of Edinburg, 100 feet northeast of State Route 14, 2,525 feet south of Booth Road. (Modal)	Glacial till	20417	0–9		
		20418	9–13		
		20419	13–21		
		20420	21–27	110	17
		20421	27–32		
		20422	32–39		
		20423	39–47		
		20424	47–60	115	15
Glenford (PG–5): Brimfield Township; ½ mile south of Kent, 250 feet west of Sunnybrook Road. (Modal)	Lacustrine silt and clay.	20404	7–10		
		20405	10–17		
		20406	17–30	110	17
		20409	30–42	99	20
		20410	42–60	99	21
Mitiwanga (PG–15): Windham Township; 1.2 mile southeast of Windham, 300 feet south of Smalley Road, and 1,800 feet east of Windham Road. (Modal)	Glacial till over sandstone bedrock.	57043	0–6	100	22
		57044	11–16	107	18
		57045	16–31	105	19
Rittman silt loam (PG–2): Atwater Township; 1¼ mile south and ½ mile east of Atwater Center, 510 feet north of Virginia Road. (Modal)	Glacial till	19031	0–9		
		19032	9–14		
		19033	14–19		
		19034	19–22		
		19035	22–26	111	16
		19037	30–35		
		19038	35–41	116	13
		19039	41–47		
		19041	51–55	121	13
		19043	62–70		

See footnotes at end of table.

test data [1]

that test was not made]

Mechanical analysis [3]					Liquid limit	Plasticity index	Classification	
Percentage passing sieve				Percentage smaller than 0.005 mm			AASHTO [4]	Unified [5]
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					
					Percent			
----------	100	96	86	50	----------	----------	----------	----------
----------	100	95	84	47	40	17	A–6(11)	CL
----------	100	96	84	51	----------	----------	----------	----------
----------	100	96	85	53	45	24	A–7–6(15)	CL
----------	100	97	89	58	----------	----------	----------	----------
----------	100	98	94	69	53	29	A–7–6(18)	CH
----------	100	99	98	68	53	29	A–7–6(18)	CH
----------	----------	----------	100	89	56	30	A–7–6(19)	CH
100	93	93	93	85	50	19	A–7–5(14)	MH
----------	100	92	77	23	----------	----------	----------	----------
----------	100	92	77	28	----------	----------	----------	----------
----------	----------	----------	----------	----------	27	9	----------	----------
----------	100	86	57	23	----------	----------	----------	----------
----------	100	84	55	20	22	5	A–4(4)	CL–ML
----------	100	84	53	18	----------	----------	----------	----------
----------	100	83	53	19	21	5	A–4(4)	CL–ML
----------	100	80	49	17	19	4	A–4(3)	SM–SC
----------	100	85	61	24	23	6	A–4(5)	CL–ML
----------	100	93	83	26	----------	----------	----------	----------
----------	100	97	92	46	42	21	A–7–6(13)	CL
----------	100	93	92	51	----------	----------	----------	----------
----------	100	97	94	51	48	25	A–7–6(16)	CL
----------	----------	----------	----------	----------	----------	----------	----------	----------
----------	100	98	94	43	----------	----------	----------	----------
----------	100	98	94	44	33	16	A–6(10)	CL
----------	100	99	97	50	38	17	A–6(11)	CL
----------	100	94	83	37	37	14	A–6(10)	CL
----------	----------	100	99	33	----------	----------	----------	----------
----------	100	94	83	28	38	17	A–6(11)	CL
----------	100	94	84	37	----------	----------	----------	----------
----------	100	94	82	39	27	2	A–4(8)	ML
94	90	79	67	29	36	11	A–6(7)	ML
100	99	96	87	45	43	19	A–7–6(13)	CL
100	98	95	85	48	43	20	A–7–6(13)	CL
----------	100	91	70	24	----------	----------	----------	----------
----------	100	93	77	31	----------	----------	----------	----------
----------	100	93	78	36	42	18	A–7–6(11)	CL
----------	100	94	80	42	----------	----------	----------	----------
----------	100	93	74	39	44	20	A–7–6(13)	CL
----------	100	93	74	39	39	18	A–6(11)	CL
----------	100	92	73	38	38	15	A–6(9)	CL
----------	100	92	74	37	32	10	A–4(8)	CL
----------	100	93	76	36	32	11	A–6(9)	CL
----------	100	93	77	40	33	12	A–6(9)	CL

TABLE 4.—*Engineering*

Soil name and location	Parent material	Report number	Depth	Moisture-density [2]	
				Maximum dry density	Optimum moisture
			Inches	*Lb. per cu. ft.*	*Percent*
Wadsworth silt loam (PG–16): Charlestown Township; 0.05 mile northwest of Augerburg; 3,000 feet east of Garrett Road; 1,700 feet north of Newton Falls Road, and 100 feet north of patrol road in Ravenna Arsenal. (Modal)	Glacial till	57046	0–8	110	17
		57047	15–27	115	15
		57048	27–40	112	16
		57049	40–50	112	16
		57050	58–84	109	17
Wooster silt loam (PG–10): Shalersville Township; 4 miles north of Ravenna; 900 feet west of the center of Infirmary Road, and 1,400 feet south of Webb Road. (Modal)	Glacial till	20425	0–9		
		20426	9–19		
		20427	19–23	107	18
		20428	23–34		
		20429	34–43		
		20430	43–60	123	11

[1] Testing was performed in the Soil Physical Studies Laboratory, Ohio State University and in the Ohio Department of Highways Testing Laboratory.
[2] Based on Designation T 99.
[3] Mechanical analyses according to AASHTO Designation T 88, except that all material coarser than 2 millimeters in diameter was excluded from most samples. Soils in this table that formed in glacial till commonly have 2 to 5 percent coarser than 2 millimeters. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey

The plastic limit is the moisture content at which the soil material changes from semisolid to plastic; and the liquid limit is the moisture content at which it changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 5, but in table 4 the data on liquid limit and plasticity index are based on tests of soil samples.

The shrink-swell potential is the relative change in volume of soil material expected as a result of changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to the maintenance of structures built in, on, or with material having this rating.

Corrosivity pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such soil properties as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations of soils

The interpretations in table 6 are based on the estimated engineering properties of the soils shown in table 5, on test data for the soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Portage County. In table 6 summarized ratings of the suitability of the soils are given for all listed purposes other than highway location, ponds and reservoirs, drainage of cultivated crops and pasture, irrigation, terraces and diversions, and grassed waterways. For these particular uses, table 6 lists those soil features not to be overlooked in planning, installation, and maintenance.

Following are explanations of the columns in table 6.

Winter grading is affected mainly by those soil features relevant to moving, mixing, and compacting soil in road building if the temperature is below freezing.

Soils most susceptible to damaging *frost action* are silt loams and fine sandy loams that are wet or saturated most of the winter. Such soils are rated high.

Topsoil is used for topdressing an area if plant cover is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as in preparing a seedbed; natural fertility of the material or plant response when fertilizer is added to the soil; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments affect suitability, and also considered

test data [1]—Continued

Mechanical analysis [3]							Classification	
Percentage passing sieve				Percentage smaller than 0.005 mm	Liquid limit	Plasticity index	AASHTO [4]	Unified [5]
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					
					Percent			
100	97	90	75	22	33	12	A–6(9)	CL
100	96	93	83	43	39	16	A–6(10)	CL
100	97	93	80	39	31	13	A–6(9)	CL
100	97	93	75	34	25	11	A–6(9)	CL
100	92	87	74	34	29	12	A–6(9)	CL
----------	100	92	77	23	----------	----------	----------	----------
----------	----------	----------	----------	----------	28	12	----------	----------
----------	100	88	62	24	28	11	A–6(6)	CL
----------	100	89	66	24	----------	----------	----------	----------
----------	100	92	66	24	26	10	A–5(6)	CL
----------	100	99	65	23	23	8	A–4(6)	CL

procedure of the Soil Conservation Service (SCS). In the procedure used, the fine material is analyzed by the hydrometer method. In the SCS procedure, the fine material is analyzed by the pipette method. The mechanical analyses used in this table may not be suitable for use in naming textural classes for soil.

[4] Based on AASHTO Designation M 145–49 (*2*).

[5] Based on the Unified soil classification system (*3*).

in the ratings is damage that can result at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 6 provide guidance about where to look for probable sources. A soil rated as a good or fair source generally has a layer of sand or gravel at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Roadfill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of a soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage, and the relative ease of excavating the material at borrow areas.

Soil properties that most affect design and construction of *highways* are load-supporting capacity, stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or to other permeable material.

Pond embankments require soil material that is resistant to seepage and piping and that is of favorable stability, shrink-swell potential, shear strength, and compactibility. Stones or organic material in a soil are among factors that are unfavorable.

Drainage of cropland and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; accumulation of salts and alkali; depth to the root zone; rate of water intake at the surface; permeability below the surface layer and in the fragipan or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to the water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or to other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

The layout and construction of *grassed waterways* are affected by such properties as texture, depth, and erodibility of the soil material; presence of stones or rock outcrops; and the steepness of slopes. Other fac-

TABLE 5.—*Estimated soil properties*

[Typic Udorthents, strip mined (TUB, TUD) and Urban land (Ur) are omitted from this table because their properties are too means more than; the

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface	USDA texture	Classification: Unified	Classification: AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Bogart: BgA, BgB, BhB. For properties of Haskins part of BhB, see Haskins series.	1½–3	>6	0–7	Silt loam	ML	A–4	0–2
			7–46	Loam, gravelly sandy loam.	ML, SM, SC	A–2, A–4, A–6	0–5
			46–60	Very gravelly sandy loam to gravel and sand.	SW–SM, SM, GW–GM, GM	A–1, A–2	0–5
Canadice: Ca	0–½	>6	0–8	Silt loam	ML, CL	A–6	0
			8–53	Silty clay loam, silty clay.	CL, CH	A–7, A–6	0
			53–60	Silty clay, clay	CL, CH	A–7	0
Caneadea: CcA, CcB	½–1½	>6	0–7	Silt loam	ML, CL	A–6	0
			7–48	Silty clay, clay	CH, CL	A–7	0
			48–68	Silty clay	CH, CL, MH	A–7	0
Canfield: CdA, CdB, CdC, CdC2, CfB, CfC. Properties not estimated for Urban land part of CfB and CfC.	1½–3	>6	0–8	Silt loam	ML	A–4	0
			8–22	Silt loam or loam	ML, CL	A–4, A–6	0
			22–59	Loam, fine sandy loam.	ML, CL, SM, SM–SC	A–4, A–6	0
			59–82	Fine sandy loam	ML, SM, CL	A–4	0–5
Carlisle: Cg	0	>6	0–60	Muck	Pt	----------	--------
Chili: CnA, CnB, CnC, CoC2, CpA, CpB, CpC, CtD, CtE, CtF, CuB, CuC, CwC2, CwD2, CwE. For properties of Oshtemo part of CtD, CtE and CtF, see Oshtemo series. For Wooster part of CwC2, CwD2, and CwE, see Wooster series. Properties not estimated for Urban land part of CuB and CuC.	>6	>6	0–9	Loam, gravelly loam, silt loam.	ML, SM	A–4, A–2	0
			9–35	Loam, gravelly clay loam.	ML, SM, SC	A–4, A–6	0
			35–54	Very gravelly sandy loam.	SM, GM	A–1, A–2	0–5
			54–70	Gravelly sand	SW–SM, GW, GM	A–1	0–10
Damascus: Da	0–½	>6	0–9	Loam	ML	A–4	0–2
			9–39	Sandy loam, gravelly sandy clay loam.	SM, CL, SC	A–4, A–6	0–5
			39–60	Loamy sand, very gravelly sand.	GW–GM, GM	A–1, A–2	0–5
Dekalb: DkB, DkC, DkD, DkF	>5	1½–3½	0–6	Channery loam	SM, ML	A–4	0–15
			6–23	Channery fine sandy loam.	SM, ML	A–2	5–15
			23–33	Very flaggy loamy sand.	GM, SM	A–2	15–90
			33	Sandstone bedrock.			
Ellsworth: ElB, ElB2, ElC, ElC2, ElD2, ElE2, EsB, EuB. Properties not estimated for Urban land part of EuB.	1½–3	[2]>6	0–9	Silt loam	ML, CL–ML	A–4	0
			9–32	Silty clay loam	CL, CH	A–6, A–7	0
			32–60	Silty clay loam	CL	A–6	0–2
Fitchville: FcA, FcB, FnA. Properties not estimated for Urban land part of FnA.	½–1½	>6	0–7	Silt loam	ML	A–4	0
			7–39	Silt loam, silty clay loam.	CL, ML	A–6, A–7	0
			39–60	Silty clay loam, silt loam.	CL, ML	A–6, A–4	0

See footnotes at end of table.

significant in engineering

variable for estimates. Absence of data indicates that the soil is too variable to be rated or that no estimate was made. The symbol > symbol <means less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				Inch per hour	*Inch per inch of soil*	*pH*	*Percent*				
90–100	80–100	70–90	60–80	0.6–6.0	0.12–0.18	5.1–6.0	25–35	2–10	Low	Moderate	Moderate.
60–95	50–90	30–70	25–60	2.0–6.0	0.07–0.12	4.5–5.5	15–30	4–13	Low	Low	High.
40–75	35–60	20–40	5–20	>6.0	0.04–0.08	5.1–6.0	<25	[1]NP–4	Low	Low	Moderate.
100	95–100	90–100	80–95	0.2–0.6	0.17–0.20	5.1–6.0	30–40	11–15	Low	High	Moderate.
100	95–100	90–100	80–100	<0.06	0.10–0.14	5.1–7.3	38–55	17–32	Moderate	High	Moderate.
100	95–100	90–100	90–100	<0.06	0.10–0.14	7.4–8.4	40–55	20–32	Moderate	High	Low.
100	95–100	90–100	70–95	0.2–0.6	0.17–0.20	4.5–6.0	30–40	11–15	Low	High	Moderate.
100	90–100	90–100	90–100	<0.06	0.10–0.14	4.5–7.8	42–60	20–35	Moderate	High	Moderate.
100	95–100	90–100	90–100	<0.06	0.10–0.14	7.4–8.4	40–55	19–32	Moderate	High	Low.
90–100	85–100	80–100	70–90	0.6–2.0	0.17–0.22	4.5–6.0	25–40	4–10	Low	Moderate	Moderate.
90–100	80–95	70–90	55–80	0.6–2.0	0.14–0.18	4.5–6.0	25–40	6–15	Low	Moderate	Moderate.
90–100	75–95	70–85	45–70	0.06–0.2	0.06–0.10	4.5–6.5	19–35	4–12	Low	Moderate	Moderate.
80–95	75–95	70–85	45–65	0.06–0.2	0.07–0.10	6.1–7.8	15–30	4–12	Low	Moderate	Low.
----	----	----	----	2.0–6.0	0.20–0.25	4.5–7.3	----	----	----	High	Moderate.
70–100	60–95	50–85	40–75	0.6–6.0	0.12–0.18	4.5–6.5	<40	NP–10	Low	Low	Moderate.
70–95	60–90	50–80	35–70	2.0–6.0	0.07–0.12	4.5–6.0	<30	NP–12	Low	Low	Moderate.
45–80	40–75	25–55	15–35	2.0–6.0	0.5–0.10	4.5–6.5	----	NP	Low	Low	Moderate.
30–60	25–55	10–30	2–15	>6.0	0.02–0.06	5.6–6.5	----	NP	Low	Low	Moderate.
90–100	80–100	70–90	60–85	0.6–6.0	0.14–0.18	4.5–6.5	25–35	4–10	Low	High	Moderate.
70–100	60–90	50–80	35–70	0.6–6.0	0.10–0.14	4.5–6.5	20–40	4–15	Low	High	Moderate.
35–80	25–70	20–60	10–35	>6.0	0.04–0.08	5.1–7.3	<30	NP–6	Low	High	Moderate.
60–90	50–80	40–70	35–55	>6.0	0.10–0.14	4.5–5.5	10–30	NP–6	Low	Low	High.
60–85	50–75	40–60	20–55	>6.0	0.08–0.12	4.5–5.5	15–30	NP–8	Low	Low	High.
35–50	30–45	20–35	15–30	>6.0	0.04–0.10	4.5–5.5	<30	NP–8	Low	Low	High.
100	95–100	90–100	75–90	0.6–2.0	0.17–0.21	4.5–6.0	20–35	4–10	Low	Moderate	Moderate.
100	90–100	85–100	80–95	0.06–0.2	0.12–0.16	4.5–6.5	35–55	14–28	Moderate	High	Moderate.
95–100	85–100	80–100	70–98	0.06–0.2	0.08–0.12	6.1–7.8	25–40	12–20	Moderate	High	Low.
100	100	95–100	85–100	0.6–2.0	0.17–0.22	4.5–6.0	20–40	4–10	Low	High	Moderate.
100	100	95–100	85–100	0.2–0.6	0.15–0.19	4.5–7.3	25–45	5–18	Moderate	High	Moderate.
100	90–100	85–100	60–95	0.2–0.6	0.14–0.18	6.1–7.8	20–35	5–15	Low	High	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Frenchtown: Fr	0–½	>6	0–7	Silt loam	ML	A–4	0
			7–30	Silt loam, silty clay loam.	CL, ML	A–6, A–4	0
			30–48	Clay loam, gravelly loam.	ML, CL	A–4, A–6	0
			48–80	Gravelly loam, clay loam, loam.	ML, CL	A–6, A–4	0–2
Geeburg: GbB, GbB2, GbC2, GbD2, GcB, GEF. Properties not estimated for Urban land part of GcB. For properties of Glenford part of GEF, see Glenford series.	1½–3	>6	0–9	Silt loam	ML, CL–ML	A–4, A–6	0
			9–30	Clay	CH, CL	A–7	0
			30–60	Silty clay	CH, CL	A–7	0
Glenford: GfA, GfB, GfC2, GfD2	1½–3	>6	0–7	Silt loam	ML	A–4	0
			7–42	Silty clay loam, silt loam.	CL, ML	A–6, A–7	0
			42–60	Silt loam	ML, CL	A–4, A–6	0
Haskins: HaB	½–1½	>6	0–13	Loam, sandy loam	ML, SM	A–4	0
			13–28	Clay loam	CL	A–6	0
			28–60	Silty clay	CL, CH	A–6, A–7	0
Holly: Ho	[3] 0–½	>6	0–11	Silt loam	ML	A–4	0
			11–25	Silt loam	ML, CL–ML	A–4	0
			25–60	Loam, silt loam	ML, SM	A–4	0
Hornell: HrB	1–3	2–3½	0–8	Silt loam	ML, CL	A–4, A–6	0
			8–31	Silty clay loam, silty loam.	CH, CL	A–7	0–10
			31–40	Partly weathered shale.			
			40	Soft, shale bedrock.			
Jimtown: JtA, JtB	½–1½	>6	0–11	Loam	ML, CL–ML	A–4	0
			11–36	Sandy loam, clay loam, gravelly sandy loam.	SM, CL, ML	A–2, A–4, A–6	0–5
			36–60	Loamy sand, sand, gravel.	SM, GM	A–1, A–2	0–5
Lakin: LaB, LaC	>6	>6	0–16	Loamy sand	SM	A–2	0
			16–60	Sand, loamy sand	SM, SC	A–2, A–3	0
Linwood: Ld	0	>6	0–29	Muck	Pt		
			29–60	Silt loam, fine sandy loam.	SM, ML	A–4	0
Lorain: Ln	0–½	>6	0–8	Silty clay loam	CL	A–6, A–7	0
			8–36	Silty clay loam, silty clay.	CL	A–7, A–6	0
			36–77	Silty clay loam, sandy loam.	CL, SC	A–7, A–6, A–2	0
Loudonville: LoB, LoC, LoC2, LoD2, LoE.	>3	1½–3½	0–6	Silt loam	ML	A–4	0–5
			6–31	Silt loam, loam, clay loam.	ML, CL	A–4, A–6	0–10
			31	Sandstone bedrock.			
Mahoning: MgA, MgB, MnB. Properties not estimated for Urban land part of MnB.	½–1½	>6	0–8	Silt loam	ML, CL–ML	A–4, A–6	0
			8–34	Silty clay loam	CL	A–6, A–7	0
			34–60	Silty clay loam	CL	A–6, A–7	0–2

See footnotes at end of table.

significant in engineering—Continued

Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity: Uncoated steel	Concrete
				Inch per hour	*Inch per inch of soil*	*pH*	*Percent*				
95–100	90–100	80–90	75–85	0.6–2.0	0.17–0.22	4.5–6.0	22–40	4–10	Low	High	Moderate.
90–100	85–95	80–90	65–85	0.6–2.0	0.15–0.19	4.5–5.5	25–40	4–15	Low	High	Moderate.
85–100	75–95	60–75	50–70	0.06–0.2	0.08–0.12	4.5–6.0	20–35	4–12	Low	High	Moderate.
85–95	75–95	60–80	50–70	0.06–0.2	0.08–0.12	5.6–8.4	20–35	4–12	Low	High	Low.
95–100	95–100	90–100	70–95	0.6–2.0	0.17–0.20	4.5–6.0	25–40	6–10	Moderate	Moderate	Moderate.
95–100	95–100	90–100	90–100	<0.06	0.10–0.14	4.5–7.8	41–60	20–32	High	High	Moderate.
95–100	95–100	90–100	90–100	<0.06	0.10–0.14	7.4–7.8	40–55	20–32	High	High	Low.
100	100	90–100	80–95	0.6–2.0	0.17–0.22	4.5–6.0	20–40	4–10	Low	Moderate	Moderate.
100	100	95–100	80–100	0.2–0.6	0.15–0.19	4.5–6.5	25–45	5–18	Moderate	Moderate	Moderate.
100	90–100	85–100	70–95	0.2–0.6	0.14–0.18	6.1–7.8	20–35	2–15	Low	Moderate	Low.
95–100	90–100	85–95	45–60	0.6–2.0	0.14–0.18	4.5–6.5	<38	NP–10	Low	High	Moderate.
90–100	85–100	70–85	50–65	0.6–2.0	0.12–0.16	4.5–6.5	22–40	12–18	Low	High	Moderate.
100	90–100	90–100	80–95	0.06–0.2	0.08–0.14	5.1–7.8	38–65	16–38	High	High	Low.
95–100	90–100	80–95	70–90	0.6–2.0	0.17–0.22	5.6–7.3	25–35	2–10	Low	High	Moderate.
95–100	90–100	80–95	60–85	0.2–2.0	0.16–0.18	5.6–7.3	20–40	4–10	Low	High	Moderate.
95–100	85–100	70–90	40–70	0.6–2.0	0.12–0.16	5.6–7.3	20–40	NP–8	Low	High	Moderate.
90–100	85–100	80–100	65–90	0.6–2.0	0.16–0.20	4.5–5.5	30–40	8–15	Low	High	High.
85–100	80–100	75–95	60–85	<0.06	0.11–0.13	4.5–5.5	40–55	16–30	Moderate	High	High.
90–100	80–95	70–85	55–70	0.6–2.0	0.16–0.20	4.5–6.5	20–30	NP–8	Low	High	Moderate.
80–95	75–90	60–75	30–60	0.6–2.0	0.10–0.16	4.5–6.5	20–35	NP–14	Low	High	Moderate.
45–100	30–100	20–60	15–35	>6.0	0.04–0.10	5.6–7.3	<25	NP–4	Low	High	Moderate.
100	100	60–100	15–35	>6.0	0.06–0.10	4.5–6.0	<35	NP–10	Low	Low	High.
100	95–100	60–100	5–35	>6.0	0.04–0.08	4.5–6.0	<35	NP–10	Low	Low	High.
---	---	---	---	>6.0	0.20–0.25	5.1–6.0	---	---	---	High	Moderate.
100	95–100	70–85	40–70	0.6–2.0	0.12–0.18	5.6–7.8	15–35	4–10	Low	High	Low.
100	100	90–100	85–100	0.2–0.6	0.15–0.19	5.1–7.3	32–50	12–25	Moderate	High	Moderate.
100	100	95–100	90–100	0.06–0.2	0.11–0.16	5.1–7.3	35–50	15–25	Moderate	High	Moderate.
100	95–100	65–100	30–100	0.06–0.2	0.10–0.16	6.6–7.8	30–50	10–25	Moderate	High	Low.
95–100	90–100	80–95	60–80	0.6–2.0	0.16–0.20	4.5–6.5	20–35	4–10	Low	Low	Moderate.
80–100	70–100	60–85	55–75	0.6–2.0	0.08–0.16	4.5–6.0	25–40	6–15	Moderate	Low	Moderate.
100	100	90–100	75–90	0.6–2.0	0.18–0.22	4.5–7.3	25–40	6–12	Low	High	Moderate.
95–100	90–100	85–95	75–90	0.06–0.2	0.14–0.18	4.5–7.8	35–50	14–25	Moderate	High	Moderate.
95–100	85–100	80–95	70–90	0.06–0.2	0.08–0.14	7.4–8.4	30–45	12–22	Moderate	High	Low.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Mitiwanga: MtA, MtB	½–1½	1½–3½	0–6	Silt loam	ML, CL–ML	A–4, A–6	0–2
			6–31	Silty clay loam	CL	A–6, A–7	0–5
			31	Sandstone bedrock.			
Mitiwanga variant: MvB, MvC	1½–3	1½–3½	0–12	Silt loam	ML	A–4	0–2
			12–39	Silty clay loam, silt loam.	CL	A–6, A–7	0–5
			39	Sandstone bedrock.			
Olmsted: Od	0–½	>6	0–9	Loam	ML	A–4	0
			9–27	Loam, sandy loam	SM, ML, SC	A–2, A–4	0
			27–60	Stratified sandy loam to gravelly sand.	SM	A–2	0–5
Orrville: Or	[3] ½–1½	>6	0–8	Silt loam	ML	A–4	0
			8–26	Loam, silt loam	ML, CL–ML	A–4	0
			26–60	Sandy loam, loamy sand.	SM, ML	A–4	0
Oshtemo: OsB, OsC	>6	>6	0–10	Sandy loam	SM	A–2, A–4	0
			10–48	Sandy loam	SM, SC	A–2, A–4	0
			48–60	Sand	SM, SP–SM	A–2, A–1	0
Ravenna: ReA, ReB	½–1½	>6	0–8	Silt loam	ML	A–4	0
			8–21	Silt loam, loam	ML, CL	A–6, A–4	0
			21–41	Loam	ML	A–4, A–6	0
			41–60	Loam	ML	A–4, A–6	0–5
Remsen: RmA, RmB	½–1½	>6	0–11	Silt loam	ML, CL	A–6	0
			11–40	Silty clay	CH, CL	A–7	0
			40–60	Silty clay	CH, CL	A–7	0
Rittman: RsB, RsC, RsC2, RsD2, RsE2.	1½–3	>6	0–14	Silt loam	ML	A–4	0
			14–26	Silty clay loam, clay loam.	CL	A–6, A–7	0
			26–47	Clay loam	CL–ML, CL	A–4, A–6	0
			47–70	Clay loam	CL–ML, CL	A–4, A–6	0–2
Sebring: Sb	0–½	>6	0–9	Silt loam	ML, CL–ML	A–4	0
			9–50	Silty clay loam, silt loam.	CL	A–6, A–7	0
			50–60	Silt loam	ML, CL	A–6, A–4	0
Sebring variant: Sv	1–½	>6	0–8	Silt loam	ML, CL	A–6, A–4	0
			8–42	Silt loam, silty clay loam.	CL, ML	A–6, A–7	0
			42–60	Silty clay loam, silt loam.	CL, ML	A–6, A–4	0
Tioga: Tg	[3] 3–6	>6	0–10	Loam	ML	A–4	0
			10–60	Fine sandy loam	ML, SM	A–4, A–2	0–5
Trumbull: TrA	0	>6	0–8	Silt loam	ML, CL–ML	A–4, A–6	0
			8–42	Silty clay, silty clay loam.	CH, CL	A–7	0
			42–60	Silty clay	CL	A–7, A–6	0
Wadsworth: WaA, WaB	½–1½	>6	0–7	Silt loam	ML, CL	A–4, A–6	0
			7–28	Silty clay loam	CL	A–6, A–7	0
			28–50	Silty clay loam	CL, CL–ML	A–6, A–4	0
			50–68	Silty clay loam	CL, CL–ML	A–6, A–4	0–2
Wallkill: Wc	0	>6	0–21	Silt loam	ML	A–4	0
			21–60	Muck	Pt	---	---

See footnote at end of table.

significant in engineering—Continued

Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity: Uncoated steel	Corrosivity: Concrete
				Inch per hour	*Inch per inch of soil*	*pH*	*Percent*				
90–100	85–100	75–90	65–80	0.6–2.0	0.17–0.20	4.5–6.0	25–40	4–12	Low	High	Moderate.
85–100	80–100	70–98	60–90	0.6–2.0	0.13–0.17	4.5–5.5	25–45	11–20	Moderate	High	Moderate.
90–100	85–100	80–90	70–85	0.6–2.0	0.17–0.20	4.5–6.0	25–40	4–10	Low	Moderate	Moderate.
85–100	80–100	75–90	65–90	0.06–0.20	0.13–0.17	4.5–5.5	25–45	11–20	Moderate	High	Moderate.
95–100	85–100	65–80	55–70	2.0–6.0	0.14–0.18	5.1–7.3	20–40	NP–10	Low	High	Moderate.
95–100	85–100	55–80	30–60	2.0–6.0	0.10–0.14	5.1–7.3	20–40	NP–15	Low	High	Moderate.
75–100	65–95	45–70	15–35	>6.0	0.06–0.10	5.6–7.3	<35	NP–8	Low	High	Moderate.
100	95–100	90–100	65–80	0.6–2.0	0.18–0.22	5.6–6.5	25–40	4–10	Low	High	Moderate.
95–100	90–100	85–95	65–90	0.6–2.0	0.15–0.19	5.6–6.5	20–40	4–10	Low	High	Moderate.
95–100	85–100	65–85	35–65	0.6–2.0	0.08–0.14	5.6–6.5	NP–35	NP–8	Low	High	Moderate.
95–100	85–100	60–70	25–40	2.0–6.0	0.08–0.14	5.1–6.5	<25	NP–4	Low	Low	Moderate.
95–100	85–100	60–85	25–45	2.0–6.0	0.05–0.14	5.1–6.0	<30	NP–12	Low	Low	Moderate.
90–100	85–100	40–60	5–25	>6.0	0.02–0.06	5.1–6.5		NP	Low	Low	Moderate.
95–100	90–100	80–90	70–85	0.6–2.0	0.17–0.22	4.5–6.5	25–40	4–10	Low	High	High.
90–100	85–100	75–95	65–80	0.6–2.0	0.14–0.18	4.5–6.0	30–40	6–15	Low	High	High.
85–100	80–95	70–05	50–70	0.06–0.2	0.06–0.10	4.5–6.0	30–40	5–12	Low	High	High.
80–95	70–95	60–80	50–65	0.06–0.2	0.06–0.10	4.5–7.3	25–40	4–12	Low	High	Moderate.
95–100	95–100	85–100	80–95	0.2–0.6	0.17–0.20	4.5–7.3	30–40	11–15	Low	High	Moderate.
95–100	95–100	90–100	90–100	<0.06	0.10–0.14	4.5–7.3	42–60	25–35	High	High	Moderate.
95–100	90–100	90–100	90–100	<0.06	0.10–0.14	7.4–7.8	40–55	20–32	High	High	Low.
95–100	90–100	85–100	70–90	0.6–2.0	0.17–0.22	4.5–7.3	25–40	4–10	Low	Moderate	Moderate.
90–100	85–100	80–95	60–85	0.6–2.0	0.14–0.18	4.5–5.5	30–45	11–20	Moderate	High	Moderate.
85–100	80–100	75–95	60–80	0.06–0.2	0.06–0.10	5.1–6.5	25–40	6–18	Low	High	Moderate.
85–100	80–100	75–95	60–85	0.06–0.2	0.06–0.12	6.1–7.8	25–35	6–14	Low	High	Low.
100	100	95–100	85–95	0.6–2.0	0.17–0.22	4.5–6.0	25–40	4–10	Low	High	Moderate.
100	95–100	90–100	80–100	0.2–0.6	0.14–0.18	4.5–7.3	30–45	11–20	Moderate	High	Moderate.
100	90–100	85–100	60–95	0.2–0.6	0.12–0.16	6.1–7.8	25–45	6–18	Low	High	Low.
100	100	90–100	85–100	0.6–2.0	0.20–0.23	5.6–6.5	20–40	6–16	Low	High	Moderate.
100	90–100	75–100	85–100	0.2–0.6	0.16–0.20	5.6–7.3	30–45	11–20	Moderate	High	Moderate.
100	90–100	75–100	50–95	0.2–0.6	0.14–0.18	6.1–7.3	25–40	6–18	Low	High	Low.
100	95–100	80–95	70–85	0.6–2.0	0.16–0.20	5.1–6.5	<15	NP–4	Low	Low	Low.
90–100	85–100	50–80	30–60	0.6–2.0	0.10–0.16	5.1–6.5	<15	NP–2	Low	Low	Low.
100	95–100	90–100	80–95	0.20–0.6	0.17–0.20	4.5–6.5	25–40	5–18	Low	High	Moderate.
95–100	90–100	85–100	80–95	<0.06	0.10–0.14	4.5–7.8	40–55	18–30	Moderate	High	Moderate.
95–100	90–100	80–95	75–95	<0.06	0.10–0.14	7.4–7.8	35–50	14–26	Moderate	High	Low.
95–100	90–100	90–100	75–90	0.6–2.0	0.17–0.22	4.5–6.5	25–40	4–12	Low	High	Moderate.
95–100	90–100	80–90	70–85	0.6–2.0	0.14–0.18	4.5–5.5	30–45	11–20	Moderate	High	Moderate.
85–100	80–100	75–95	60–85	0.06–0.2	0.06–0.10	5.1–7.3	25–40	6–16	Low	High	Moderate.
85–100	80–100	75–95	60–85	0.06–0.2	0.06–0.12	6.1–7.8	25–35	6–14	Low	High	Low.
100	100	90–100	75–90	0.6–2.0	0.18–0.21	4.5–6.0	10–20	2–4	Low	High	Moderate.
				>6.0	0.20–0.25	4.5–6.0				High	Moderate.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface	USDA texture	Classification Unified	Classification AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Wheeling: WhA, WhB	>6	>6	0–10	Silt loam	ML	A–4	0
			10–39	Silty clay loam, sandy clay loam.	ML, CL, SC	A–4, A–6	0
			39–60	Very gravelly loamy coarse sand.	GM, SM	A–1, A–2	5–10
Wooster: WuB, WuC, WuC2, WuD2, WuE2.	>3	>6	0–9	Silt loam	ML	A–4	0
			9–23	Loam	ML, CL	A–4, A–6	0
			23–43	Loam	ML, CL	A–4, A–6	0–5
			43–60	Loam	ML, SM, CL	A–4, A–6	0–5

[1] NP means nonplastic.
[2] In EsB, bedrock is at a depth of 3½ to 5 feet.

tors affecting waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation, and the ease of establishing and maintaining a plant cover.

Land Use Planning

Portage County is a part of the rapidly expanding industrial and residential part of northeastern Ohio. Housing developments, highways, factories, and shopping centers compete for acreage with farming and other land uses, and farming in the county is declining.

The expansion of nonfarm uses of land can remove many acres from agricultural use in a short period of time. Shopping centers can easily cover 50 to 100 acres, and freeways and superhighways displace as much as 50 acres per mile of farmland.

Land use planners will find other useful information on the soil maps and in other parts of this survey. Table 7 gives the estimated degree and kinds of limitation of soils for some land uses. This information can also be used for long-range planning and zoning of alternative land uses. Because extensive manipulation of the soil alters some of its natural properties, the limitations for some uses will no longer apply in areas that have undergone extensive cutting and filling.

The degree of limitation of the soil for a specified land use is given as slight, moderate, or severe. *Slight* indicates that the soil has no important limitation for the specified use. *Moderate* indicates that the soil has some limitations for the specified use. These limitations must be recognized, but they can be overcome or corrected. *Severe* indicates that the soil has serious limitations that are costly and difficult to overcome.

Following are explanations of the uses evaluated in table 7.

Under *farming* the soils have been evaluated only according to their limitations when used for cultivated crops. The degree of limitation is based on slope and the hazard of erosion or on the ease or difficulty of obtaining artificial drainage. Limitations to farming uses of the soils are given in this table mainly for comparison with other nonfarm uses of the soils.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to the water table or rock, and susceptibility to flooding. Properties that affect layout and construction of the system are slope, the risk of erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. They need to be protected from flooding. A lagoon has a nearly level floor and its sides, or embankments, are of soil material compacted to medium density. Properties that affect the pond floor are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified Soil Classification and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Dwellings, as rated in table 7, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the use of a soil for dwellings are those that relate to capacity to support load and resist settlement under load and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Liquid limit	Plasticity index	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				Inch per hour	*Inch per inch of soil*	*pH*	*Percent*				
100	90–100	85–100	60–90	0.6–2.0	0.17–0.21	4.5–6.0	20–40	2–10	Low	Low	Moderate.
70–100	65–100	60–95	45–80	0.6–2.0	0.10–0.16	4.5–6.0	20–40	4–15	Low	Low	Moderate.
40–80	30–75	20–70	5–25	>6.0	0.04–0.10	5.1–6.5		NP	Low	Low	Moderate.
95–100	90–100	85–95	60–85	0.6–2.0	0.17–0.22	4.5–7.3	25–40	4–10	Low	Low	Moderate.
90–100	80–100	70–90	55–75	0.6–2.0	0.14–0.18	4.5–6.0	25–40	6–15	Low	Low	Moderate.
85–100	85–100	75–95	50–70	0.2–0.6	0.07–0.10	4.5–6.0	25–40	6–12	Low	Low	Moderate.
85–100	80–100	75–100	40–70	0.2–2.0	0.07–0.10	4.5–6.5	20–40	4–12	Low	Low	Moderate.

[3] Subject to flooding.

content of stones and rocks.

Roads and streets, as shown in table 7, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or a high water table.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the limitations apply only to the soil material to a depth of about 6 feet, so a limitation of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet; nevertheless, every site should be investigated before it is selected.

Lawns, landscaping, and golf fairways are areas leveled and graded for homes and golf courses. The surface layer of the natural soil, or topsoil, can be used for lawns, flowers, shrubs, and trees, and should be saved. It can be removed from the site, stored until construction and grading are completed, and then returned. The surface soil from areas graded for streets also can be saved and used for lawns and fairways. Among the soil properties that determine whether a good lawn or golf fairway can be established are natural drainage, degree of slope, depth to bedrock, texture of the surface layer, stoniness and rockiness, and hazard of flooding.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suited to this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops. They have good drainage and are not subject to flooding during periods of heavy use. The surface is firm after rain, but not dusty when dry. If grading and leveling are needed, depth to rock is important.

Picnic areas are natural or landscaped tracts that withstand heavy foot traffic. Most of the vehicular traffic is confined to access roads. The best soils are firm when wet but not dusty when dry, are not flooded during the season of use, and do not have slopes or stones that can greatly increase the cost of leveling or of building access roads.

Campsites are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is needed, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, and a surface free of rocks and coarse fragments and are not subject to flooding during periods of heavy use. The surface is firm after rain but not dusty when dry.

Paths and trails are used for local and cross-country travel by foot or horseback. There should be little or no cutting and filling for paths and trails. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

TABLE 6.—*Interpretations of engineering*

[Typic Udorthents, strip mined (TUB, TUD) and Urban land (Ur) are omitted from

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Bogart: BgA, BgB, BhB. For Haskins part of BhB, see Haskins series.	Fair to good: loamy material, but seasonally wet; coarse material in substratum.	Moderate	Fair: thin layer; some gravelly material.	Fair below a depth of 3 feet.	Fair to a depth of 3 feet, good below a depth of 3 feet.
Canadice: Ca	Poor: seasonal high water table; clayey, plastic material, sticky when wet.	High	Poor: wetness.	Unsuitable	Poor: clayey material; moderate shrink-swell potential; poor workability.
Caneadea: CcA, CcB	Poor: seasonal high water table; clayey, plastic material, sticky when wet.	High	Poor: thin layer.	Unsuitable	Poor: clayey material; moderate shrink-swell potential; poor workability.
Canfield: CdA, CdB, CdC, CdC2, CfB, CfC. No interpretations for Urban land part of CfB and CfC.	Fair: loamy material, but seasonally wet.	Moderate	Good	Unsuitable	Fair: moderate stability; low shrink-swell potential; easy to compact; erodible on slopes.
Carlisle: Cg	Poor: organic material; commonly saturated.	High	Fair to good if mixed with mineral soil, poor if used alone: wetness.	Unsuited	Poor: organic material.
Chili: CnA, CnB, CnC, CoC2, CpA, CpB, CpC, CtD, CtE, CtF, CuB, CuC, CwC2, CwD2, CwE. For Oshtemo part of CtD, CtE, and CtF and Wooster part of CwC2, CwD2, and CwE, see Oshtemo and Wooster series. No interpretations for Urban land part of CuB and CuC.	Good: well drained soil.	Low	Fair if nongravelly units; poor in gravelly units; some steep and very steep slopes.	Good below a depth of 3 feet.	Good if slope is less than 12 percent, fair if 12 to 25 percent, poor if 25 to 50 percent.
Damascus: Da	Poor: poorly drained; seasonal high water table.	High	Poor: wetness.	Good below a depth of 3 feet.	Poor: wetness; loamy and gravelly materials.
Dekalb: DkB, DkC, DkD, DkF	Fair: well drained; bedrock at a depth of 20 to 40 inches.	Low	Poor: channery material; steep slopes.	Unsuitable	Fair if slope is less than 25 percent, poor if more than 25 percent.

properties of the soils

this table because their properties are too variable for making interpretations]

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Good stability; seasonal wetness.	Excessive seepage in substratum.	Fair to good stability and compaction; medium to high permeability.	Seasonal high water table of short duration; moderately rapid permeability.	Moderate to low available water capacity; rapid intake rate.	Generally not needed; slow runoff.	Short slopes; slow runoff; droughty channels.
Seasonal high water table; clayey material; poor workability.	Seasonal high water table; very slow seepage; nearly level.	Low permeability; clayey material; poor compaction.	Very slow permeability; seasonal high water table.	Very slow permeability; poor drainage.	Nearly level; poorly drained.	Poorly drained; clayey below surface layer; difficult to work.
Seasonal high water table; clayey material; poor workability.	Seasonal high water table; very slow seepage.	Low permeability; clayey material; poor compaction.	Very slow permeability; seasonal high water table.	Somewhat poorly drained; very slow permeability.	Somewhat poorly drained; short slopes.	Somewhat poorly drained; clayey below surface layer; difficult to work.
Seasonal wetness; moderate susceptibility to frost action.	Slow seepage; sloping in some areas.	Fair stability and compaction; low seepage; slight hazard of piping.	Moderately well drained; slow permeability in fragipan.	Moderate available water capacity; medium intake rate; slow permeability in and below fragipan; erodes easily.	Seepage in channels in some places; moderately well drained.	Seepage in channels in some places; moderately well drained; erodes easily.
Organic soil; high water table; soft and unstable.	High water table; organic material.	Unstable organic material; high seepage.	High water table; organic soil; very unstable; subsides when drained.	High available water capacity and water intake; very poorly drained; subject to blowing if drained.	Not needed	Not needed.
Good stability; well drained; cut slopes are droughty; steep and very steep slopes in some places.	Rapid seepage; pervious sandy, gravelly material in substratum.	Good stability; rapid seepage; droughty.	Not needed; well drained.	Moderate to low available water capacity; rapid intake rate.	Well drained; generally short slopes; droughty.	Well drained; generally short slopes; droughty.
Seasonal high water table; poorly drained; nearly level.	Rapid seepage; seasonal high water table.	Good stability; rapid seepage.	Moderate permeability; seasonal high water table; ditch wells unstable.	Moderate available water capacity; rapid intake rate; poorly drained.	Generally not needed; nearly level; poorly drained.	Poorly drained; nearly level.
Bedrock is at a depth of 20 to 40 inches; well drained; very steep slopes in some places.	Rapid seepage; bedrock at a depth of 20 to 40 inches; very steep slopes in some places.	Limited material; high permeability; fair stability.	Not needed; well drained.	Low available water capacity; moderate depth to bedrock; erodible on slopes.	Moderate depth to bedrock; well drained and droughty; very steep slopes in some places.	Moderate depth to bedrock; well drained and droughty; very steep slopes in some places.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Ellsworth: ElB, ElB2, ElC, ElC2, ElD2, ElE2, EsB, EuB. No interpretations for Urban land part of EuB.	Poor: seasonal wetness; sticky when wet.	Moderate	Fair: thin, steep slopes.	Unsuitable	Fair: clayey; moderate shrink-swell potential.
Fitchville: FcA, FcB, FnA. No interpretations for Urban land part of FnA.	Poor: somewhat poorly drained; seasonally wet; soft, easily compressible material; seasonal high water table.	High	Good	Unsuitable	Poor: silty material; medium to high compressibility.
Frenchtown: Fr	Poor: poorly drained; seasonal high water table.	High	Poor: wetness.	Unsuitable	Poor: fair to poor stability; wetness.
Geeburg: GbB, GbB2, GbC2, GbD2, GcB, GEF. No interpretations for Urban land part of GcB. For Glenford part of GEF, see Glenford series.	Poor: clayey, plastic material; seasonal wetness; sticky when wet.	Moderate	Fair: thin layer.	Unsuitable	Poor: clayey material; high shrink-swell potential; steep slopes in some places.
Glenford: GfA, GfB, GfC2, GfD2	Poor: seasonal wetness; soft material.	High	Fair: thin layer.	Unsuitable	Poor: fair to poor stability and compaction; subject to frost action.
Haskins: HaB	Poor: seasonal high water table.	Moderate to high.	Fair: thin layer.	Unsuitable	Fair in upper 20 to 40 inches; fair stability and compaction; poor in substratum.
Holly: Ho	Poor: subject to flooding; seasonal high water table.	High	Poor: wetness.	Unsuitable	Fair: fair to poor stability; wetness.

properties of the soils—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Seasonal wetness; steep slopes in some places; bedrock at a depth of 40 to 60 inches in some places.	Slow seepage; steep slopes in some places; seasonal wetness.	Fair to good stability and compaction; low permeability; slow seepage.	Moderately well drained; slow permeability.	Moderate available water capacity; slow permeability; slow intake rate.	Slow permeability; channels difficult to vegetate; steep slopes in some places.	Slow permeability; channels difficult to vegetate and can be seepy.
Seasonal high water table; soft and compressible when wet; cut slopes are erodible and susceptible to slippage.	Seasonal high water table; slow seepage.	Fair stability and compaction; low permeability; erodible on slopes; subject to piping.	Moderately slow permeability; seasonal high water table; ditch wells are unstable.	Moderate to high available water capacity; moderately slow permeability; somewhat poorly drained.	Seasonally wet; erodes easily.	Somewhat poorly drained; short slopes; erodes easily.
Seasonal high water table; subject to frost action.	Seasonal high water table; slow seepage.	Fair to poor stability and compaction; low permeability.	Slow permeability; seasonal high water table.	Moderate available water capacity; slow permeability; slow intake rate.	Poorly drained; slow permeability.	Poorly drained.
Seasonal wetness; clayey material; difficult to work; steep slopes in some places.	Slow seepage; clayey material; steep slopes in some places.	Fair to poor stability and compaction; low permeability; high shrink-swell potential.	Moderately well drained; very slow permeability.	Moderate available water capacity; slow intake rate; slow permeability.	Very slow permeability; clayey material; difficult to work and vegetate; seasonally wet; steep slopes in some places.	Clayey material, difficult to work; high runoff; seasonally wet; steep slopes in some places.
Seasonally wet; soft and compressible; cut slopes are erodible and susceptible to slippage; steep slopes in some places.	Slow seepage; steep slopes in some places.	Fair tó poor stability and compaction; moderately low permeability; poor resistance to piping.	Moderately well drained; moderately slow permeability; ditch banks unstable.	High available water capacity; medium intake rate; moderately well drained.	Moderately well drained; seepy; erodes easily; steep slopes in some places.	Seasonally wet and seepy; channels are erodible; steep slopes in some places.
Seasonal high water table; substratum is clayey and difficult to work.	Moderate seepage in upper 20 to 40 inches; clayey substratum has slow seepage.	Fair to good stability and compaction; low permeability; good resistance to piping.	Seasonal high water table; slow permeability below a depth of 20 to 40 inches.	Moderate available water capacity; medium intake rate; somewhat poorly drained.	Somewhat poorly drained; short slopes; seepy.	Somewhat poorly drained; may be seepy; erodes easily.
Subject to flooding; seasonal high water table.	Subject to flooding; seasonal high water table; possible excessive seepage in substratum.	Fair to poor stability and compaction; low permeability.	Moderately slow permeability; subject to flooding; outlets difficult to obtain in some places; poorly drained.	High available water capacity; medium intake rate; poorly drained; subject to flooding.	Not needed -----	Nearly level; subject to flooding; poorly drained.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Hornell: HrB	Poor: seasonal high water table; clayey material, sticky when wet.	Moderate	Fair: thin layer.	Unsuited	Poor: clayey material; moderate depth to bedrock.
Jimtown: JtA, JtB	Poor: seasonal high water table; loamy material over sand and gravel.	Moderate	Fair: thin layer.	Fair to good below a depth of 3 feet.	Fair: seasonal high water table; fair stability and compaction.
Lakin: LaB, LaC	Good: well drained; sandy material.	Low	Poor: sandy material low in organic-matter content.	Good source of sand; unsuited for gravel.	Good: sandy material.
Linwood: Ld	Poor: organic material; commonly saturated.	High	Good if mixed with mineral soil; poor if used alone: wetness.	Unsuitable	Poor: organic material; wetness.
Lorain: Ln	Poor: seasonal high water table; clayey material, sticky when wet.	Moderate	Poor: wetness.	Unsuitable	Poor: clayey material; wetness.
Loudonville: LoB, LoC, LoC2, LoD2, LoE.	Fair: well drained; bedrock at a depth of 20 to 40 inches.	Low	Fair: thin layer; steep slopes in some places.	Unsuitable	Fair: silty and loamy material; bedrock at a depth of 20 to 40 inches.
Mahoning: No interpretations for Urban land part of MnB.	Poor: sticky when wet; seasonal high water table.	High	Fair: thin layer.	Unsuitable	Poor: medium to high compressibility; clayey material; low strength.

properties of the soils—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Seasonal high water table; moderate depth to bedrock.	Moderate depth to bedrock; possible rapid seepage.	Seasonal high water table; fair stability and compaction; low compacted permeability.	Commonly needs random drainage; outlets difficult to obtain because of shale bedrock at a moderate depth.	Moderate rooting depth; slow intake rate; low available water capacity.	Seasonal high water table; clayey material; moderate depth to bedrock; erodes easily; difficult to vegetate.	Generally short slopes; seasonal high water table; clayey material; hard to work; difficult to vegetate.
Seasonal high water table; easy to work.	Excessive seepage; seasonal high water table.	Fair stability and compaction; high seepage.	Seasonal high water table; moderate to rapid permeability.	Moderate available water capacity; rapid intake rate; somewhat poorly drained.	Somewhat poorly drained; slow runoff.	Somewhat poorly drained; easy to work; erodes easily.
Well drained soil; cut areas are sandy and droughty; slopes are erodible and unstable.	Sandy material; rapid seepage.	Fair compaction and stability; rapid seepage; poor resistance to piping; droughty.	Not needed; well drained.	Rapid rate; low available water capacity.	Channels and berms are droughty; erodible on slopes.	Droughty; sandy material is erodible on slopes.
Organic material; highly unstable; very poorly drained.	High water table; high organic-matter content.	Organic material is unstable; excessive seepage; loamy substratum.	High water table most of year; unstable muck; subject to subsidence if drained.	High available water capacity; rapid intake rate; very poorly drained.	Not needed	Not needed.
Seasonal high water table; plastic clayey material, difficult to work.	Seasonal high water table; very slow seepage; suitable for dug ponds.	Clayey material; good stability; fair compaction; low compacted permeability.	Seasonal high water table; slow permeability; outlets difficult to locate; ditchbanks unstable.	Needs drainage; slow intake rate; moderate to high available water capacity.	Not needed	Seasonal high water table; clayey material, difficult to work.
Well drained; sandstone at a depth of 20 to 40 inches; steep slopes in some places.	Bedrock at a depth of 20 to 40 inches; moderate seepage; steep slopes in some places.	Fair stability and compaction; moderately thick over bedrock.	Not needed; well drained.	Moderate depth to bedrock; moderate to low available water capacity; medium intake rate.	Moderately deep to bedrock; steep slopes in some places.	Bedrock at a depth of 20 to 40 inches; well drained; droughty channels.
Seasonal high water table; poor workability when wet.	Seasonal high water table; slow seepage.	Fair to good stability and compaction; low seepage; good resistance to piping.	Slow permeability; seasonal high water table.	Moderate available water capacity; slow intake rate; somewhat poorly drained.	Somewhat poorly drained; clayey subsoil.	Seepy cut channels in spring and droughty in summer; difficult to vegetate; somewhat poorly drained.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Mitiwanga: MtA, MtB	Poor: seasonal high water table; bedrock at a depth of 20 to 40 inches.	High	Fair: thin layer.	Unsuitable	Poor: fair to poor stability and compaction; bedrock at a depth of 20 to 40 inches.
Mitiwanga variant: MvB, MvC	Fair: seasonal wetness; bedrock at a depth of 20 to 40 inches.	Moderate	Fair: thin layer.	Unsuitable	Fair: seasonal wetness; clayey material; bedrock at a depth of 20 to 40 inches.
Olmsted: Od	Poor: very poorly drained; seasonal high water table.	High	Poor: wetness.	Poor to a depth of 5 feet, fair below.	Poor: wetness.
Orrville: Or	Poor: seasonal high water table; subject to flooding.	High	Good	Unsuitable	Poor: low strength; subject to frost action.
Oshtemo: OsB, OsC	Good: well drained; sandy material.	Low	Good	Good for sand below a depth of 3 feet; poor for gravel.	Good: good stability.
Ravenna: ReA, ReB	Poor: seasonal high water table.	High	Good	Unsuitable	Fair: fair to good stability and compaction.
Remsen: RmA, RmB	Poor: seasonal high water table; clayey plastic material, sticky when wet.	Moderate	Fair: shallow to clay.	Unsuitable	Poor: clayey material.

properties of the soils—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Seasonal high water table; bedrock at a depth of 20 to 40 inches.	Bedrock at a depth of 20 to 40 inches; rapid seepage.	Fair to poor stability and compaction; low permeability; limited suitable material.	Bedrock at a depth of 20 to 40 inches; moderate permeability; somewhat poorly drained.	Bedrock at a depth of 20 to 40 inches; moderate available water capacity; medium intake rate; somewhat poorly drained.	Bedrock at a depth of 20 to 40 inches; somewhat poorly drained.	Somewhat poorly drained; droughty channels in summer; bedrock at a depth of 20 to 40 inches.
Seasonal wetness; moderate depth to bedrock.	Moderate depth to bedrock; rapid seepage.	Fair stability and compaction; low permeability when compacted; moderate depth to bedrock.	Moderately well drained; moderate depth to bedrock.	Moderate available water capacity; medium intake rate.	Bedrock at a depth of 20 to 40 inches; moderately well drained.	Seasonal wetness; erodible on slopes; bedrock at a depth of 20 to 40 inches.
High water table for long periods; fair workability.	High water table; excessive seepage.	Fair stability and compaction; medium permeability when compacted; pervious substratum.	Very poorly drained; moderately rapid permeability.	Moderate available water capacity; rapid intake rate; very poorly drained.	Nearly level; very poorly drained.	Very poorly drained; nearly level.
Subject to flooding; high water table during winter and spring; low strength.	Subject to flooding; moderate seepage; occasional sandy seams.	Poor stability and compaction; moderate permeability; poor resistance to piping.	Moderate permeability; seasonal high water table; subject to flooding; outlets difficult to obtain in some places.	High available water capacity; medium intake rate; subject to flooding; somewhat poorly drained.	Nearly level; subject to flooding; seasonal high water table.	Subject to flooding and siltation; seasonal high water table.
Well drained soil; unstable and droughty cut slopes.	Pervious sandy material; excessive seepage.	Fair to good stability and compaction; excessive seepage; subject to piping.	Not needed; well drained.	Low available water capacity; moderately rapid intake rate.	Well drained; droughty and erodible channels.	Well drained; droughty and erodible channels.
High water table during winter and spring; seepage above fragipan.	Seasonal high water table; slow seepage.	Fair to good stability and compaction; low permeability; fair resistance to piping.	Slow permeability; seasonal high water table.	Moderate available water capacity; medium to slow intake rate; somewhat poorly drained.	Somewhat poorly drained; seepage above fragipan.	Somewhat poorly drained; seepage above fragipan; cut channels are likely to be droughty.
Seasonal high water table; low stability; high content of clay; high shrink-swell potential.	Seasonal high water table; very slow seepage.	Fair to poor compaction; low seepage; high shrink-swell potential.	Very slow permeability; seasonal high water table.	Slow infiltration; moderate available water capacity.	Shallow to clay; somewhat poorly drained; vegetative cover difficult to establish.	Moderately erodible; somewhat poorly drained; vegetative cover difficult to establish.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Rittman: RsB, RsC, RsC2, RsD2, RsE2.	Fair to poor: loamy material; seasonal wetness.	Moderate	Fair: thin layer.	Unsuitable	Fair: fair stability and compaction.
Sebring: Sb	Poor: poorly drained; seasonal high water table; soft material.	High	Poor: wetness.	Unsuitable	Poor: wetness; low strength.
Sebring variant: Sv	Poor: very poorly drained; seasonal high water table; soft.	High	Poor: wetness.	Unsuitable	Poor: silty material; low strength; wetness.
Tioga: Tg	Good: subject to flooding.	Moderate	Good	Locally fair for sand below a depth of 4 feet.	Fair: fair to poor stability.
Trumbull: TrA	Poor: poorly drained; seasonal high water table; clayey material, sticky when wet.	High	Poor: wetness.	Unsuitable	Poor: wetness; fair to poor stability and compaction.
Wadsworth: WaA, WaB	Poor: seasonal high water table; sticky when wet.	High	Fair: thin layer.	Unsuitable	Fair: wetness.
Wallkill: Wc	Poor: seasonal high water table; organic underlying material.	High	Poor: wetness.	Unsuitable	Poor: wetness; low strength; organic material below a depth of 2 to 3 feet.
Wheeling: WhA, WhB	Good: silty and loamy material over sand and gravel.	Moderate	Fair: thin layer.	Good below a depth of 3 to 5 feet.	Fair in upper layers, good in substratum.

properties of the soils—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Some steep slopes; seasonal wetness; some seepage.	Slow seepage; moderately well drained.	Fair to good stability and compaction; low seepage.	Moderately well drained; slow permeability.	Moderate available water capacity; medium to slow intake rate; moderately well drained.	Seepage in some places; seasonally wet; steep slopes in some places.	Seepage in some places; erodes easily; moderately well drained.
High water table for long periods; soft and compressible when wet.	Seasonal high water table; moderately slow seepage.	Fair to poor stability and compaction; low permeability; fair to poor resistance to piping.	Moderately slow permeability; seasonal high water table; ditch walls tend to collapse.	High available water capacity; medium intake rate; poorly drained.	Not needed ------	Poorly drained; nearly level.
High water table most of the year; soft and unstable when wet.	Seasonal high water table; slow seepage.	Fair to poor stability and compaction; low permeability.	Moderately slow permeability; high water table; outlets lacking in some places; ditchbanks unstable.	High available water capacity; medium intake rate; very poorly drained.	Generally not needed; nearly level; very poorly drained.	Nearly level; very poorly drained.
Subject to flooding; well drained.	Moderate seepage; subject to flooding.	Fair stability and compaction; medium permeability; poor resistance to piping.	Not needed; well drained.	Moderate available water capacity; subject to flooding.	Generally not needed.	Generally not needed.
Seasonal high water table; low strength.	Seasonal high water table; very slow seepage.	Low permeability; fair to poor stability and compaction.	Very slow permeability; poorly drained.	Moderate available water capacity; slow intake rate; poorly drained.	Poorly drained; nearly level.	Poorly drained; nearly level.
High water table during winter and spring.	Slow seepage; seasonal high water table.	Fair to good stability and compaction; low permeability; good to fair resistance to piping.	Slow permeability; seasonal high water table.	Moderate available water capacity; medium to slow intake rate; somewhat poorly drained.	Somewhat poorly drained; seepage in some places.	Somewhat poorly drained; seepage in some places.
Subject to ponding; soft and unstable; highly unstable underlying organic material.	Seasonal high water table; organic material below a depth of 2 to 3 feet.	Fair compaction of mineral layers; unsuitable underlying organic layers.	High water table; subject to ponding; very unstable underlying material.	High available water capacity; medium intake rate; poorly drained; subject to ponding.	Poorly drained; subject to ponding.	Poorly drained; subject to ponding.
Well drained soil; moderate permeability.	Excessive seepage in substratum.	Fair stability and compaction; moderate to high seepage.	Not needed; well drained.	Moderate available water capacity; moderate intake rate; moderate permeability.	Well drained; erodes easily.	Well drained, erodes easily.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Roadfill
Wooster: WuB, WuC, WuC2, WuD2, WuE2.	Fair to good: well drained; loamy material.	Moderate	Good: steep slopes in some places.	Unsuitable	Fair: fair to good compaction and strength; steep slopes in some places.

Descriptions of the Soils

This section describes each soil series in detail and then, briefly, each mapping unit in that series. Unless stated otherwise, what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface down to rock or other underlying material. Each series contains two descriptions of the profile. The first is brief and in terms familiar to a layman. The second is more detailed and is included for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Urban land, for example, does not belong to a soil series; nevertheless, it is listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is a symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland suitability group in which the mapping unit has been placed. The page where each capability unit is described is listed in the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 8. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual *(10)*.

Bogart Series

The Bogart series consists of deep, moderately well drained, nearly level to gently sloping soils that formed in sandy and gravelly glacial outwash material. These soils are on terraces and outwash plains throughout the county.

In a representative profile the surface layer is dark grayish brown silt loam 7 inches thick. The subsoil, to a depth of 16 inches, is mottled friable yellowish brown loam. Between depths of 16 and 46 inches, it is mottled yellowish brown loam, yellowish brown gravelly sandy clay loam, and brown gravelly sandy loam. The substratum to a depth of 60 inches is mottled brown very gravelly sandy loam.

Bogart soils have a moderately deep to deep root zone and a moderate to low available water capacity. Permeability is moderately rapid in the upper 36 to 50 inches and is rapid in the underlying coarser material. The soils have a high water table for short periods in winter and spring.

Bogart soils are not extensive in this survey area. They are used for cultivated crops, pasture, and woodland. Where cultivated, the main crops grown are corn, wheat, and grass-legume meadow.

Representative profile of Bogart silt loam, 0 to 2 percent slopes, in Mantua Township, 5 miles northwest of Mantua, 190 feet south of Harner Road and 1,340 feet west of Mantua Center Road (Profile PG–4 in the section "Laboratory Data"):

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable; 5 percent gravel; very strongly acid; abrupt smooth boundary.

B1—7 to 16 inches; yellowish brown (10YR 5/4) loam that has occasional zones of light yellowish brown (10YR 6/4); moderate fine and medium subangular blocky structure; friable; 10 percent gravel; very strongly acid; gradual wavy boundary.

B21t—16 to 24 inches; yellowish brown (10YR 5/6) loam; common medium distinct brown (7.5YR 4/4) and pale brown (10YR 6/3) and few fine distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; friable; thin patchy clay films on ped faces; 12 percent gravel; very strongly acid; clear wavy boundary.

IIB22t—24 to 37 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam; many medium distinct light brownish gray (10YR 6/2), common medium distinct dark brown (7.5YR 4/4), and few fine distinct light yellowish brown (2.5Y 6/4) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; medium patchy clay films on ped faces and coating

properties of the soils—Continued

Soil features affecting—						
Highway location	Ponds		Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways
	Reservoir area	Embankment				
Well drained soil; steep slopes in some places.	Slow seepage; steep slopes in some places.	Fair to good stability and compaction; moderate seepage; slight hazard of piping.	Not needed; well drained.	Moderate available water capacity; moderate intake rate; moderate permeability.	Well drained; steep slopes in some places; erodes easily.	Well drained; steep slopes in some places; erodes easily.

gravel; few medium black (10YR 2/1) stains on ped interiors; 20 percent gravel; very strongly acid; clear wavy boundary.

IIB3—37 to 46 inches; brown (7.5YR 4/4) gravelly coarse sandy loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; thin very patchy clay films on peds and coating gravel; few black (10YR 2/1) stains; about 20 percent gravel; very strongly acid; clear wavy boundary.

IIC—46 to 60 inches; brown (10YR 4/3) very gravelly sandy loam that has thin strata of very gravelly sandy clay loam; common medium distinct light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; massive; friable; about 80 percent gravel; strongly acid.

The solum is 30 to 50 inches thick. The B horizon is very strongly acid to strongly acid, and the C horizon is strongly acid to medium acid.

The Ap horizon is silt loam or loam. It is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The B horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. It is gravelly loam, gravelly sandy loam, loam, sandy clay loam, or gravelly sandy clay loam. The C horizon is very gravelly loam, very gravelly sandy loam, gravelly loam, gravelly loamy sand, and gravelly sandy loam. In places it has thin layers of very gravelly sandy clay loam.

Bogart soils are the moderately well drained member of a drainage sequence that includes the well drained Chili soils, the somewhat poorly drained Jimtown soils, the poorly drained Damascus soils, and the very poorly drained Olmsted soils. Bogart soils are commonly adjacent to Glenford, Chili, and Jimtown soils. They are similar to Chili soils except that they have gray mottles in the B horizon. They have less gray color in the B horizon than Jimtown soils and less silt and more gravel in the B and C horizons than Glenford soils.

BgA—Bogart silt loam, 0 to 2 percent slopes. This is a nearly level soil on outwash terraces. Areas seldom exceed 10 acres in size. This soil has the profile described as representative of the series.

Included in mapping are areas that have a surface layer of loam. These areas are less susceptible to surface crusting than areas where the surface layer is silt loam. Also included are small spots of the more silty Glenford soils and small spots of the wetter Jimtown soils that are generally low on the landscape.

Runoff is slow, and there is little or no hazard of erosion. This soil tends to be droughty, but there is sufficient moisture for most crops. This soil is well suited to irrigation. A seasonal high water table is the major limitation for some nonfarm uses. Capability unit IIs–1; woodland suitability group 2o1.

BgB—Bogart silt loam, 2 to 6 percent slopes. This is a gently sloping soil in small areas seldom exceeding 10 acres in size. Included in mapping are some areas of soils that have a surface layer of loam; a few areas of the well drained, steeper Chili soils; and a few small areas of the more silty Glenford soils.

Runoff is medium, and erosion is a hazard if cultivated crops are grown or if the soil is disturbed by construction. This soil dries more quickly in spring than the nearly level Bogart soil. It tends to be droughty, but generally there is sufficient moisture for cultivated crops. This soil is suited to irrigation. A seasonal high water table that occurs for short periods in winter and spring is the major limitation for some nonfarm uses. Capability unit IIe–4; woodland suitability group 2o1.

BhB—Bogart-Haskins complex, 2 to 6 percent slopes. This mapping unit consists of about 50 percent Bogart soils, about 40 percent Haskins soils, and about 10 percent Jimtown soils. It is mostly on gently undulating terraces in the vicinity of Ravenna. The Bogart part formed in fairly thick outwash material, although, in places, underlying glacial till or clayey material is at a depth of only 40 to 60 inches. The Haskins part formed in thin outwash material and in the underlying glacial till or clayey lacustrine material that is within a depth of 20 to 40 inches. Haskins soils are wetter than Bogart soils. Both Haskins and Jimtown soils are somewhat poorly drained.

Runoff is medium, and the hazard of erosion is moderate in areas where runoff is concentrated. Seasonal wetness is the major limitation for some nonfarm uses. Capability unit IIw–4; woodland suitability group 2o1.

Canadice Series

The Canadice series consists of deep, poorly drained, nearly level to slightly depressional soils that formed in water-deposited, clayey sediments. These soils are on terraces mainly in the northern part of the county.

In a representative profile the surface layer is dark gray silt loam about 8 inches thick. The upper part of the subsoil, between depths of 8 and 32 inches, is mottled gray silty clay loam. The lower part of the subsoil and the substratum to a depth of 63 inches are mottled gray silty clay.

Canadice soils have a moderately deep root zone in

TABLE 7.—*Estimated degree and kind of*

[Typic Udorthents, strip mined (TUB, TUD) and Urban land (Ur)

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Bogart:					
BgA	Slight	Moderate: seasonal high water table.[1]	Severe: rapid permeability.[1]	Moderate: seasonal high water table.	Slight
BgB, BhB For Haskins part of BhB, see that series.	Slight	Moderate: seasonal high water table.[1]	Severe: rapid permeability.[1]	Moderate: seasonal high water table.	Slight
Canadice: Ca	Severe: wetness.	Severe: very slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.
Caneadea:					
CcA	Moderate: wetness.	Severe: very slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table; low strength.	Severe: seasonal high water table; low strength.
CcB	Moderate: wetness.	Severe: very slow permeability; seasonal high water table.	Moderate: slope.	Severe: seasonal high water table; low strength.	Severe: seasonal high water table; low strength.
Canfield:					
CdA	Slight	Severe: slow permeability; seasonal high water table.	Slight	Moderate: seasonal high water table.	Slight
CdB, CfB Urban land part of CfB not rated.	Slight	Severe: slow permeability; seasonal high water table.	Moderate: slope.	Moderate: seasonal high water table.	Slight
CdC, CdC2, CfC Urban land part of CfC not rated.	Moderate: slope and erosion.	Severe: slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.	Moderate: slope.
Carlisle: Cg	Moderate: wetness.	Severe: high water table.	Severe: organic soil.	Severe: organic soil; unstable; high water table.	Severe: organic soil; high water table; soft and compressible.
Chili:					
CnA, CpA	Slight	Slight [1]	Severe: [1] rapid permeability.	Slight	Slight
CnB, CpB, CuB Urban land part of CuB not rated.	Slight	Slight [1]	Severe: [1] rapid permeability.	Slight	Slight
CnC, CoC2, CpC, CuC, CwC2 Urban land part of CuC not rated. For Wooster part of CwC2 see WuC2 in that series.	Moderate: slope and erosion.	Moderate: [1] slope.	Severe: [1] rapid permeability; slope.	Moderate: slope.	Moderate: slope.
CtD, CtE, CwD2, CwE For Wooster part of CwD2 and CwE see WuD2 and WuE2 in that series.	Severe: slope and erosion.	Severe: [1] slope	Severe: [1] rapid permeability; slope.	Severe: slope	Severe: slope

See footnote at end of table.

limitation of soils for land use planning

are not evaluated because their properties are too variable]

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Moderate: frost action.	Moderate: seasonal high water table.	Severe: permeable substratum.[1]	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.	Slight.
Moderate: frost action.	Moderate: seasonal high water table.	Severe: permeable substratum.[1]	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.	Slight.
Severe: seasonal high water table; low strength.	Severe: seasonal high water table.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table.	Severe: very slow permeability; seasonal high water table.	Severe: seasonal high water table.	Severe: very slow permeability; seasonal high water table.	Severe: seasonal high water table.
Severe: low strength.	Severe: seasonal high water table.	Severe: seasonal high water table; clayey.	Moderate: seasonal high water table.	Severe: very slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Severe: very slow permeability; seasonal high water table.	Moderate: seasonal high water table.
Severe: low strength.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: very slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Severe: very slow permeability; seasonal high water table.	Moderate: seasonal high water table.
Moderate: frost action.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Slight	Moderate: slow permeability.	Slight	Moderate: slow permeability.	Slight.
Moderate: frost action.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Slight	Moderate: slow permeability; slope.	Slight	Moderate: slow permeability.	Slight.
Moderate: slope; frost action.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slow permeability; slope.	Slight.
Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.
Slight	Moderate: gravelly layers.	Severe: pervious substratum.[1]	Moderate: limited available water.	Slight	Slight	Slight	Slight.
Slight	Moderate: gravelly layers.	Severe: pervious substratum.[1]	Moderate: limited available water.	Moderate: slope.	Slight	Slight	Slight.
Moderate: slope.	Moderate: slope; gravelly layers.	Severe: pervious substratum.[1]	Moderate: limited available water; slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope.	Severe: slope.	Severe: pervious substratum.[1]	Severe: slope; droughty.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Chili—continued					
CtF	Severe: slope and erosion.	Severe:[1] slope	Severe:[1] rapid permeability; slope.	Severe: slope	Severe: slope
Damascus: Da	Moderate: wetness.	Severe:[1] seasonal high water table.	Severe:[1] rapid permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
Dekalb:					
DkB	Slight	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches.
DkC	Moderate: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: slope; depth to sandstone bedrock is 20 to 40 inches.
DkD	Severe: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: slope
DkF	Severe: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: slope
Ellsworth:					
ElB, ElB2, EuB Urban land part of EuB not rated.	Moderate: slope; erosion.	Severe: slow permeability.	Moderate: slope.	Moderate: seasonal high water table.	Moderate: shrink-swell potential.
ElC, ElC2	Severe: slope; erosion.	Severe: slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.	Moderate: slope; shrink-swell potential.
ElD2	Severe: slope; erosion.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
ElE2	Severe: slope; erosion.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
EsB	Moderate: slope; erosion.	Severe: slow permeability.	Moderate: slope; depth to bedrock is 40 to 60 inches.	Moderate: seasonal high water table; depth to bedrock is 40 to 60 inches.	Moderate: shrink-swell potential.
Fitchville: FcA, FcB, FnA Urban land part of FnA not rated.	Slight	Severe: seasonal high water table; moderately slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table; low strength.	Severe: seasonal high water table; low strength.

See footnote at end of table.

limitation of soils for land use planning—Continued

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Severe: slope.	Severe: slope.	Severe: pervious substratum; slope.[1]	Severe: slope; droughty.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Severe: seasonal high water table; frost action.	Severe: seasonal high water table.	Severe: seasonal high water table; pervious material.[1]	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches.	Severe: channery surface layer.	Moderate: channery surface layer.	Moderate: channery surface layer.	Moderate: channery surface layer.
Moderate: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: slope; depth to sandstone bedrock is 20 to 40 inches.	Severe: slope; channery surface layer.	Moderate: slope; channery surface layer.	Moderate: slope; channery surface layer.	Moderate: channery surface layer.
Severe: slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: slope.	Severe: slope; channery surface layer.	Severe: slope.	Severe: slope.	Moderate: slope; channery surface layer.
Severe: slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: slope.	Severe: slope; channery surface layer.	Severe: slope.	Severe: slope.	Severe: slope.
Moderate: frost action; shrink-swell potential.	Moderate: seasonal high water table.	Moderate: seasonal high water table; too clayey.	Moderate: slow permeability.	Moderate: slow permeability.	Slight	Moderate: slow permeability.	Slight.
Moderate: slope; frost action; shrink-swell potential.	Moderate: seasonal high water table; slope.	Moderate: slope; seasonal high water table; too clayey.	Moderate: slope; slow permeability.	Severe: slope.	Moderate: slope.	Moderate: slow permeability; slope.	Slight.
Severe: slope.	Severe: slope.	Moderate: slope; seasonal high water table; too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Moderate: frost action; shrink-swell potential.	Moderate: seasonal high water table; depth to bedrock is 40 to 60 inches.	Severe: depth to bedrock is 40 to 60 inches.	Moderate: slow permeability.	Moderate: slow permeability; slope.	Slight	Moderate: slow permeability.	Slight.
Severe: frost action.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Frenchtown: Fr	Moderate: wetness.	Severe: seasonal high water table; slow permeability.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.
Geeburg: GbB, GbB2, GcB. Urban land part of GcB not rated.	Moderate: slope; erosion.	Severe: very slow permeability.	Moderate: slope.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential.
GbC2	Severe: slope; erosion.	Severe: very slow permeability.	Severe: slope	Severe: high shrink-swell potential.	Severe: high shrink-swell potential.
GbD2	Severe: slope; erosion.	Severe: very slow permeability; slope.	Severe: slope	Severe: slope; high shrink-swell potential.	Severe: slope; high shrink-swell potential.
GEF	Severe: slope; erosion.	Severe: slope	Severe: slope	Severe: slope; subject to slippage.	Severe: slope; subject to slippage.
Glenford: GfA	Slight	Severe: moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; low strength.	Moderate: low strength.
GfB	Slight	Severe: moderately slow permeability.	Moderate: slope; seasonal high water table.	Moderate: seasonal high water table; low strength.	Moderate: low strength.
GfC2	Moderate: slope; erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: seasonal high water table; low strength; slope.	Moderate: low strength; slope.
GfD2	Severe: slope; erosion.	Severe: moderately slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Haskins: HaB	Slight	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Holly: Ho	Moderate: wetness; flooding.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.
Hornell: HrB	Moderate: wetness.	Severe: depth to shale bedrock is 20 to 40 inches; seasonal high water table.	Severe: depth to shale bedrock is 20 to 40 inches.	Severe: seasonal high water table; depth to shale bedrock is 20 to 40 inches.	Severe: seasonal high water table.

See footnote at end of table.

limitation of soils for land use planning—Continued

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Severe: seasonal high water table; frost action.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: high shrink-swell potential; low strength.	Severe: too clayey.	Severe: too clayey.	Severe: very slow permeability; clayey subsoil; droughty.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Slight.
Severe: high shrink-swell potential; low strength.	Severe: too clayey.	Severe: too clayey.	Severe: very slow permeability; clayey subsoil; droughty.	Severe: very slow permeability; slope.	Moderate: slope; seasonal high water table.	Severe: very slow permeability.	Slight.
Severe: slope; high shrink-swell potential; low strength.	Severe: too clayey; slope.	Severe: slope; too clayey.	Severe: slope; very slow permeability; droughty.	Severe: very slow permeability; slope.	Severe: slope.	Severe: slope; very slow permeability.	Moderate: slope.
Severe: slope; subject to slippage.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Severe: frost action; soft when wet.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.	Slight.
Severe: frost action; soft when wet.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table; slope.	Slight	Moderate: seasonal high water table.	Slight.
Severe: frost action; soft when wet.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope; seasonal high water table.	Slight.
Severe: slope; frost action; soft when wet.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Moderate: seasonal high water table; low strength.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Severe: subject to flooding; seasonal high water table; frost action.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.
Severe: low strength.	Severe: seasonal high water table; depth to shale bedrock is 20 to 40 inches.	Severe: seasonal high water table; depth to shale bedrock is 20 to 40 inches.	Moderate: seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.	Severe: very slow permeability.	Moderate: seasonal high water table.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Jimtown: JtA, JtB	Slight	Severe: seasonal high water table.	Severe: rapid permeability in substratum; seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Lakin:					
LaB	Moderate: droughtiness.	Slight [1]	Severe: rapid permeability.[1]	Slight	Slight
LaC	Moderate: slope; droughtiness.	Moderate: [1] slope.	Severe: rapid permeability.[1]	Moderate: slope.	Moderate: slope.
Linwood: Ld	Moderate: wetness.	Severe: high water table.	Severe: organic soil.	Severe: organic soil; unstable; high water table.	Severe: organic soil; unstable; high water table.
Lorain: Ln	Moderate: wetness.	Severe: slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.
Loudonville:					
LoB	Slight	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches.
LoC, LoC2	Moderate: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches; slope.
LoD2, LoE	Severe: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: slope
Mahoning:					
MgA	Moderate: wetness.	Severe: seasonal high water table; slow permeability.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.
MgB, MnB Urban land part of MnB not rated.	Moderate: wetness; slope.	Severe: seasonal high water table; slow permeability.	Moderate: slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.

See footnote at end of table.

limitation of soils for land use planning—Continued

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Severe: frost action; seasonal high water table.	Severe: seasonal high water table.	Severe: pervious material; seasonal high water table.[1]	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Slight	Severe: cut banks unstable.	Severe: rapid permeability.[1]	Severe: low available water capacity.	Moderate: slope; too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Moderate: slope.	Severe: cut banks unstable.	Severe: rapid permeability.[1]	Severe: low available water capacity.	Severe: slope.	Moderate: slope; too sandy.	Moderate: slope; too sandy.	Moderate: too sandy.
Severe: organic soil; high water table; soft and compressible.	Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.	Severe: organic soil; high water table.
Severe: seasonal high water table; low strength.	Severe: seasonal high water table; too clayey.	Severe: seasonal high water table; too clayey.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Moderate: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches.	Moderate: slope; depth to sandstone bedrock is 20 to 40 inches.	Slight	Slight	Slight.
Moderate: slope; depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: slope; depth to sandstone bedrock is 20 to 40 inches.	Severe: slope.	Moderate: slope.	Moderate: slope.	Slight.
Severe: slope.	Severe: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Severe: frost action; moderately clayey material.	Severe: seasonal high water table.	Moderate: seasonal high water table; moderately clayey texture.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Severe: frost action; moderately clayey material.	Severe: seasonal high water table.	Moderate: seasonal high water table; moderately clayey texture.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Mitiwanga:					
MtA	Moderate: wetness.	Severe: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: seasonal high water table.
MtB	Moderate: wetness; slope; erosion.	Severe: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: seasonal high water table.
Mitiwanga variant:					
MvB	Moderate: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Moderate: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.
MvC	Severe: slope; erosion.	Severe: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Moderate: slope; depth to bedrock is 20 to 40 inches; seasonal high water table.
Olmsted: Od	Slight	Severe: high water table.[1]	Severe: rapid permeability in substratum; seasonal high water table.[1]	Severe: high water table.	Severe: high water table.
Orrville: Or	Slight	Severe: seasonal high water table; subject to flooding.	Severe: subject to flooding; seasonal high water table.	Severe: seasonal high water table; subject to flooding.	Severe: subject to flooding.
Oshtemo:					
OsB	Moderate: droughtiness.	Slight[1]	Severe: moderately rapid permeability.[1]	Slight	Slight
OsC	Severe: slope; erosion.	Moderate: slope.[1]	Severe: moderately rapid permeability.[1]	Moderate: slope.	Moderate: slope.
Ravenna:					
ReA	Slight	Severe: seasonal high water table; slow permeability.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.
ReB	Slight	Severe: seasonal high water table; slow permeability.	Moderate: slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.

See footnote at end of table.

limitation of soils for land use planning—Continued

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Severe: frost action.	Severe: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Moderate: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Severe: frost action.	Severe: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Moderate: seasonal high water table; depth to sandstone bedrock is 20 to 40 inches.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches.	Moderate: slope; depth to sandstone bedrock is 20 to 40 inches; seasonal high water table.	Slight	Moderate: seasonal high water table.	Slight.
Moderate: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Severe: depth to sandstone bedrock is 20 to 40 inches.	Moderate: depth to sandstone bedrock is 20 to 40 inches; slope.	Severe: slope.	Moderate: slope.	Moderate: seasonal high water table; slope.	Slight.
Severe: high water table.	Severe: high water table.	Severe: high water table; rapid permeability in substratum.[1]	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: subject to flooding; frost action.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: seasonal high water table; subject to flooding.	Moderate: seasonal high water table; subject to flooding.	Severe: seasonal high water table; subject to flooding.	Moderate: seasonal high water table; subject to flooding.
Slight	Severe: cutbanks unstable.	Severe: pervious material.[1]	Severe: droughty.	Moderate: slope.	Slight	Slight	Slight.
Moderate: slope.	Severe: cutbanks unstable.	Severe: pervious material.[1]	Severe: droughty.	Severe: slope.	Moderate: slope.	Moderate: slope.	Slight.
Severe: frost action.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Severe: frost action.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Remsen:					
RmA	Moderate: wetness.	Severe: seasonal high water table; slow permeability.	Slight	Severe: seasonal high water table; high shrink-swell potential.	Severe: high shrink-swell potential.
RmB	Moderate: wetness; slope; erosion.	Severe: seasonal high water table; very slow permeability.	Moderate: slope.	Severe: seasonal high water table; high shrink-swell potential.	Severe: high shrink-swell potential.
Rittman:					
RsB	Slight	Severe: slow permeability.	Moderate: slope.	Moderate: seasonal high water table.	Slight
RsC, RsC2	Moderate: slope; erosion.	Severe: slow permeability.	Severe: slope	Moderate: seasonal high water table; slope.	Moderate: slope.
RsD2, RsE2	Severe: slope; erosion.	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Sebring: Sb	Moderate: wetness.	Severe: seasonal high water table; moderately slow permeability.	Severe: seasonal high water table.	Severe: low strength; seasonal high water table.	Severe: low strength; seasonal high water table.
Sebring variant: Sv	Moderate: wetness.	Severe: seasonal high water table; moderately slow permeability.	Severe: seasonal high water table.	Severe: low strength; seasonal high water table.	Severe: low strength; seasonal high water table.
Tioga: Tg	Slight	Severe: subject to flooding.[1]	Severe: subject to flooding; moderately rapid permeability.[1]	Severe: subject to flooding.	Severe: subject to flooding.
Trumbull: TrA	Severe: wetness.	Severe: very slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.
Wadsworth:					
WaA	Moderate: wetness.	Severe: slow permeability; seasonal high water table.	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.
WaB	Moderate: wetness; slope.	Severe: slow permeability; seasonal high water table.	Moderate: slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.

See footnote at end of table.

limitation of soils for land use planning—Continued

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Severe: high shrink-swell potential.	Severe: seasonal high water table; too clayey.	Severe: too clayey.	Severe: very slow permeability.	Severe: very slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Moderate: seasonal high water table.
Severe: high shrink-swell potential.	Severe: seasonal high water table; too clayey.	Severe: too clayey.	Severe: very slow permeability.	Severe: very slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Moderate: seasonal high water table.
Moderate: shrink-swell potential; frost action.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderately clayey texture.	Moderate: slow permeability.	Moderate: slow permeability; slope.	Slight	Moderate: slow permeability.	Slight.
Moderate: slope; frost action; shrink-swell potential.	Moderate: seasonal high water table; slope.	Moderate: seasonal high water table; clayey texture; slope.	Moderate: slope; slow permeability.	Severe: slope.	Moderate: slope.	Moderate: slow permeability; slope.	Slight.
Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Severe: seasonal high water table; frost action.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: seasonal high water table; frost action.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; moderately rapid permeability.[1]	Slight	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight.
Severe: seasonal high water table; frost action; clayey material.	Severe: seasonal high water table; too clayey.	Severe: seasonal high water table; too clayey.	Severe: seasonal high water table; very slow permeability.	Severe: seasonal high water table; very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Severe: seasonal high water table.
Severe: frost action.	Severe: seasonal high water table.	Moderate: seasonal high water table; moderately clayey texture.	Moderate: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Severe: frost action.	Severe: seasonal high water table.	Moderate: seasonal high water table; moderately clayey texture.	Moderate: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.

TABLE 7.—*Estimated degree and kind of*

Soil series and map symbols	Farming (cultivated crops)	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Dwellings without basements
Wallkill: Wc	Moderate: wetness.	Severe: subject to ponding; high water table.	Severe: high water table.	Severe: subject to ponding; high water table; low strength.	Severe: subject to ponding; high water table; low strength.
Wheeling:					
WhA	Slight	Slight [1]	Severe: rapid permeability.[1]	Slight	Slight
WhB	Slight	Slight [1]	Severe: rapid permeability.[1]	Slight	Slight
Wooster:					
WuB	Slight	Severe: moderately slow permeability.	Moderate: slope.	Slight	Slight
WuC, WuC2	Moderate: slope; erosion.	Severe: moderately slow permeability.	Severe: slope	Moderate: slope.	Moderate: slope.
WuD2	Severe: slope; erosion.	Severe: slope; moderately slow permeability.	Severe: slope	Severe: slope	Severe: slope
WuE2	Severe: slope; erosion.	Severe: slope; moderately slow permeability.	Severe: slope	Severe: slope	Severe: slope

[1] Risk of polluting underground water supplies, springs, and nearby streams because filtration may be inadequate.

summer when the water table is low. The available water capacity is moderate, and permeability is very slow. The soils are saturated for periods late in winter, in spring, and early in summer. They are slow to dry out in spring. Canadice soils are low in organic-matter content and tend to form clods if worked when too wet.

Few areas have been adequately drained for most crops or for pasture. Most areas are wooded or brushy.

Representative profile of Canadice silt loam, in Ravenna Township, 600 feet south-southeast of the intersection of State Route 88 and bypass State Route 14, 200 feet east of State Route 88 (Profile PG-11 in the section "Laboratory Data"):

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam; moderate medium and fine granular structure; friable; strongly acid; abrupt smooth boundary.

B21tg—8 to 16 inches; gray (10YR 5/1) silty clay loam; common fine and medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, plastic when wet; thin patchy clay films on ped faces; very strongly acid; clear smooth boundary.

B22tg—16 to 26 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/8) and a few fine and medium prominent yellowish red (5YR 5/6) mottles; moderate coarse prismatic structure parting to strong fine and medium subangular blocky; firm, very plastic when wet; dark gray (N 4/0) medium continuous clay films on vertical ped surfaces; thin gray (10YR 5/1) clay films on horizontal ped surfaces; very strongly acid; clear smooth boundary.

B23tg—26 to 32 inches; gray (N 5/0) silty clay loam; common medium and coarse distinct light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to strong fine and medium subangular blocky; firm, very plastic when wet; dark gray (N 4/0) medium patchy clay films mainly on vertical ped surfaces; strongly acid; clear wavy boundary.

B24tg—32 to 43 inches; gray (N 6/0) silty clay; many medium and coarse prominent dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, very plastic when wet; thin very patchy clay films on vertical ped faces; slightly acid; clear wavy boundary.

B3—43 to 53 inches; gray (N 5/0) silty clay; many medium distinct olive brown (2.5Y 4/4) and yellowish brown (10YR 5/4) mottles; massive; firm, plastic when wet; neutral; diffuse wavy boundary.

C—53 to 63 inches; gray (N 5/0) silty clay; many fine and medium distinct olive brown (2.5Y 4/4) mottles; massive; firm, plastic when wet; mildly alkaline, calcareous.

Solum thickness and depth to carbonates are 36 to 60 inches. Reaction ranges from strongly acid to medium acid in the upper part of the subsoil and from slightly acid to neutral in the lower part of the subsoil.

The Ap horizon is dark gray (10YR 4/1) or gray (10YR 5/1). The A1 horizon is typically very dark grayish brown

limitation of soils for land use planning—Continued

Roads and streets	Shallow excavations	Sanitary landfill (trench)	Lawns, landscaping, and golf fairways	Playgrounds	Picnic areas	Campsites	Paths and trails
Severe: subject to ponding; high water table; low strength.	Severe: high water table.	Severe: subject to ponding; high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: subject to ponding; high water table.	Severe: high water table.
Slight	Slight	Severe: pervious substratum.[1]	Slight	Slight	Slight	Slight	Slight.
Slight	Slight	Severe: pervious substratum.[1]	Slight	Moderate: slope.	Slight	Slight	Slight.
Moderate: frost action.	Slight	Slight	Slight	Moderate: slope; moderately slow permeability.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: slope; frost action.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope; moderately slow permeability.	Slight.
Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

(10YR 3/2) or very dark gray (10YR 3/1) and is 1 to 4 inches thick. The A2 horizon is gray (10YR 5/1) or light gray (10YR 6/1) and is 3 to 9 inches thick. The B2 horizon has a hue of 10YR through 5Y, value of 4 through 6, and chroma of 0, 1, or 2. It is silty clay loam, silty clay, and clay.

Canadice soils are the poorly drained member of a drainage sequence that includes the somewhat poorly drained Caneadea soils and the very poorly drained Lorain soils. Canadice soils are commonly adjacent to Mahoning, Sebring, and Fitchville soils. They have more clay than Sebring and Fitchville soils. They lack coarse fragments and are more gray throughout than Mahoning soils. They are similar to Trumbull soils but lack coarse fragments and are underlain by stratified material. They lack the dark colored A horizon of the Lorain soils.

Ca—Canadice silt loam. This is a nearly level to slightly depressional soil. Most areas are 5 to 20 acres in size.

Included in mapping are spots of the very poorly drained Lorain soils in shallow depressions. These spots have a mucky surface layer 1 to 4 inches thick.

Runoff is slow to ponded. Seasonal wetness, very slow permeability, and poor stability when wet are the major limitations for most uses of this soil. Because of very slow permeability and lack of adequate outlets, tile drains do not work well. Capability unit IVw–1; woodland suitability group 2w1.

Caneadea Series

The Caneadea series consists of deep, somewhat poorly drained, nearly level to gently sloping soils that formed in clayey sediments that accumulated in ponded areas. These soils are in postglacial lake beds mainly in the northern part of the county.

In a representative profile the surface layer is dark, grayish brown silt loam 7 inches thick. The subsoil extends to a depth of 48 inches; it is mostly mottled yellowish brown and olive brown silty clay and clay in the upper part and dark grayish brown clay in the lower part. The substratum to a depth of 68 inches is dark grayish brown and olive brown weakly laminated silty clay.

Caneadea soils have a mostly moderately deep root zone and a moderate available water capacity. Permeability is very slow. The soils are saturated with free water late in winter and spring, and they dry out slowly in spring.

The soils are mainly used as pasture or woodland. Some areas are cultivated. Areas no longer being cultivated are reverting to brush.

Representative profile of Caneadea silt loam, 2 to 6 percent slopes, in Aurora Township, about 4 miles southwest of Aurora, 1,500 feet east of the Summit

TABLE 8.—*Acreage and proportionate extent of the soils*

Soil name	Area	Extent	Soil name	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Bogart silt loam, 0 to 2 percent slopes	590	0.2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	421	.1
Bogart silt loam, 2 to 6 percent slopes	3,639	1.2	Glenford silt loam, 12 to 18 percent slopes, moderately eroded	103	([1])
Bogart-Haskins complex, 2 to 6 percent slopes	576	.2	Haskins loam, 2 to 6 percent slopes	515	.2
Canadice silt loam	4,180	1.3	Holly silt loam	10,414	3.3
Caneadea silt loam, 0 to 2 percent slopes	528	.2	Hornell silt loam, 3 to 8 percent slopes	107	([1])
Caneadea silt loam, 2 to 6 percent slopes	759	.2	Jimtown loam, 0 to 2 percent slopes	2,831	.9
Canfield silt loam, 0 to 2 percent slopes	309	.1	Jimtown loam, 2 to 6 percent slopes	2,044	.6
Canfield silt loam, 2 to 6 percent slopes	17,728	5.6	Lakin loamy sand, 2 to 6 percent slopes	535	.2
Canfield silt loam, 6 to 12 percent slopes	1,157	.4	Lakin loamy sand, 6 to 12 percent slopes	223	.1
Canfield silt loam, 6 to 12 percent slopes, moderately eroded	784	.2	Linwood muck	722	.2
Canfield-Urban land complex, undulating	1,337	.4	Lorain silty clay loam	1,365	.4
Canfield-Urban land complex, rolling	186	.1	Loudonville silt loam, 2 to 6 percent slopes	3,576	1.1
Carlisle muck	6,359	2.0	Loudonville silt loam, 6 to 12 percent slopes	1,331	.4
Chili loam, 0 to 2 percent slopes	555	.2	Loudonville silt loam, 6 to 12 percent slopes, moderately eroded	1,289	.4
Chili loam, 2 to 6 percent slopes	8,124	2.5	Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	750	.2
Chili loam, 6 to 12 percent slopes	4,184	1.3	Loudonville silt loam, 18 to 25 percent slopes	261	.1
Chili gravelly loam, 6 to 12 percent slopes, moderately eroded	3,984	1.2	Mahoning silt loam, 0 to 2 percent slopes	9,019	2.8
Chili silt loam, 0 to 2 percent slopes	754	.2	Mahoning silt loam, 2 to 6 percent slopes	35,954	11.3
Chili silt loam, 2 to 6 percent slopes	4,268	1.4	Mahoning-Urban land complex, undulating	2,090	.6
Chili silt loam, 6 to 12 percent slopes	1,765	.6	Mitiwanga silt loam, 0 to 2 percent slopes	765	.2
Chili-Oshtemo complex, 12 to 18 percent slopes	4,653	1.5	Mitiwanga silt loam, 2 to 6 percent slopes	1,576	.5
Chili-Oshtemo complex, 18 to 25 percent slopes	1,284	.4	Mitiwanga silt loam, moderately well drained variant, 2 to 6 percent slopes	983	.3
Chili-Oshtemo complex, 25 to 50 percent slopes	557	.2	Mitiwanga silt loam, moderately well drained variant, 6 to 12 percent slopes	263	.1
Chili-Urban land complex, undulating	2,009	.6	Olmsted loam	777	.2
Chili-Urban land complex, rolling	760	.2	Orrville silt loam	3,280	1.0
Chili-Wooster complex, 6 to 12 percent slopes, moderately eroded	2,797	.9	Oshtemo sandy loam, 2 to 6 percent slopes	1,345	.4
Chili-Wooster complex, 12 to 18 percent slopes, moderately eroded	1,573	.5	Oshtemo sandy loam, 6 to 12 percent slopes	544	.2
Chili-Wooster complex, 18 to 30 percent slopes	506	.2	Ravenna silt loam, 0 to 2 percent slopes	5,643	1.8
Damascus loam	4,759	1.5	Ravenna silt loam, 2 to 6 percent slopes	9,734	3.0
Dekalb channery loam, 2 to 6 percent slopes	557	.2	Remsen silt loam, 0 to 2 percent slopes	6,342	2.0
Dekalb channery loam, 6 to 12 percent slopes	568	.2	Remsen silt loam, 2 to 6 percent slopes	16,473	5.2
Dekalb channery loam, 12 to 25 percent slopes	264	.1	Rittman silt loam, 2 to 6 percent slopes	6,366	2.0
Dekalb channery loam, 25 to 70 percent slopes	378	.1	Rittman silt loam, 6 to 12 percent slopes	1,031	.3
Ellsworth silt loam, 2 to 6 percent slopes	7,164	2.3	Rittman silt loam, 6 to 12 percent slopes, moderately eroded	1,108	.4
Ellsworth silt loam, 2 to 6 percent slopes, moderately eroded	1,596	.5	Rittman silt loam, 12 to 18 percent slopes, moderately eroded	390	.1
Ellsworth silt loam, 6 to 12 percent slopes	3,066	1.0	Rittman silt loam, 18 to 25 percent slopes, moderately eroded	53	([1])
Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded	4,986	1.6	Sebring silt loam	9,596	3.0
Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded	1,954	.6	Sebring silt loam, dark surface variant	759	.2
Ellsworth silt loam, 18 to 40 percent slopes, moderately eroded	1,434	.5	Tioga loam	1,055	.3
Ellsworth silt loam, sandstone substratum, 2 to 6 percent slopes	207	.1	Trumbull silt loam, 0 to 2 percent slopes	11,623	3.7
Ellsworth-Urban land complex, undulating	642	.2	Typic Udorthents, strip mined, undulating	704	.2
Fitchville silt loam, 0 to 2 percent slopes	3,053	1.0	Typic Udorthents, strip mined, hilly	194	.1
Fitchville silt loam, 2 to 6 percent slopes	1,710	.5	Urban land	164	.1
Fitchville-Urban land complex, nearly level	316	.1	Wadsworth silt loam, 0 to 2 percent slopes	3,900	1.2
Frenchtown silt loam	3,988	1.3	Wadsworth silt loam, 2 to 6 percent slopes	12,991	4.1
Geeburg silt loam, 2 to 6 percent slopes	5,571	1.8	Wallkill silt loam	241	.1
Geeburg silt loam, 2 to 6 percent slopes, moderately eroded	979	.3	Wheeling silt loam, 0 to 2 percent slopes	171	.1
Geeburg silt loam, 6 to 12 percent slopes, moderately eroded	3,167	1.0	Wheeling silt loam, 2 to 6 percent slopes	1,506	.5
Geeburg silt loam, 12 to 18 percent slopes, moderately eroded	762	.2	Wooster silt loam, 2 to 6 percent slopes	4,913	1.5
Geeburg-Urban land complex, undulating	304	.1	Wooster silt loam, 6 to 12 percent slopes	1,517	.5
Geeburg and Glenford silt loams, steep	914	.3	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	2,208	.7
Glenford silt loam, 0 to 2 percent slopes	145	([1])	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	514	.2
Glenford silt loam, 2 to 6 percent slopes	1,231	.4	Wooster silt loam, 18 to 50 percent slopes, moderately eroded	113	([1])
			Borrow pits	247	.1
			Cut and fill land	2,409	.8
			Cut and fill land, highways	1,431	.5
			Gravel pits	1,738	.6
			Quarries	392	.1
			Water	2,315	.7
			Soils less than 0.05 percent of the county		.2
			Total	316,544	100.0

[1] Less than 0.05 percent.

County line, 200 feet south of Davis Road (Profile PG-1 in the section "Laboratory Data"):

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; very strongly acid; abrupt smooth boundary.
B&A—7 to 10 inches; light brownish gray (2.5Y 6/2) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; light brownish gray (2.5Y 6/2) silt coatings on ped faces; very strongly acid; clear wavy boundary.
B21t—10 to 17 inches; yellowish brown (10YR 5/4) and light brownish gray (2.5Y 6/2) silty clay; few medium distinct yellowish brown (10YR 5/6) mottles; strong medium prismatic structure parting to moderate medium subangular blocky; firm; medium patchy grayish brown (2.5Y 5/2) clay films on ped faces; very strongly acid; clear smooth boundary.
B22t—17 to 23 inches; olive brown (2.5Y 4/4) clay; common fine distinct gray (5Y 5/1) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; medium continuous grayish brown (10YR 5/2) clay films on vertical ped faces and thin patchy clay films in pores; medium acid; clear smooth boundary.
B23t—23 to 29 inches; dark grayish brown (2.5Y 4/2) clay; many fine distinct gray (5Y 5/1) mottles; strong coarse prismatic structure; firm; medium continuous grayish brown (2.5Y 5/2) clay films on vertical ped faces; thin patchy grayish brown (2.5Y 5/2) clay films in ped interiors and pores; neutral; gradual smooth boundary.
B24t—29 to 36 inches; dark grayish brown (2.5Y 4/2) clay; common fine distinct gray (5Y 5/1) mottles; moderate coarse prismatic structure; firm; medium patchy grayish brown (2.5Y 5/2) clay films on vertical ped faces and as pore fillings in ped interiors; mildly alkaline; clear wavy boundary.
B3—36 to 48 inches; dark grayish brown (2.5Y 4/2) silty clay; weak coarse prismatic structure; firm thin very patchy grayish brown (2.5Y 5/2) clay films on vertical ped faces; moderately alkaline, calcareous; gradual wavy boundary.
C1—48 to 57 inches; dark grayish brown (2.5Y 4/2) silty clay; weak thin platy structure; firm; horizontal and vertical seams of gray (5Y 5/1) along fracture planes; moderately alkaline, calcareous; gradual smooth boundary.
C2—57 to 68 inches; olive brown (2.5Y 4/4) silty clay; weak thin platy structure; firm; gray (5Y 5/1) horizontal seams 6 to 12 inches apart; common coarse calcium carbonate concretions; moderately alkaline; calcareous.

The solum is 36 to 55 inches thick. The upper part of the B horizon is very strongly acid to medium acid and the lower part of the B horizon is slightly acid to mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). The B2t horizon is yellowish brown (10YR 5/4), olive brown (2.5Y 4/4), dark yellowish brown (10YR 4/4), and dark grayish brown (2.5Y 4/2). The C horizon is silty clay loam or silty clay.

Caneadea soils are the somewhat poorly drained member of a drainage sequence that includes the poorly drained Canadice and the very poorly drained, dark colored Lorain soils. Caneadea soils are commonly adjacent to Mahoning, Canadice, Fitchville, and Sebring soils. They have fewer coarse fragments than Mahoning soils and less clay than Fitchville and Sebring soils. They are similar to the Remsen soils, but are underlain by stratified material and have fewer coarse fragments.

CcA—Caneadea silt loam, 0 to 2 percent slopes. This is a nearly level soil on terraces. Most areas of this soil are 5 to 20 acres in size. Included in mapping are small areas of poorly drained Canadice soils in shallow drainageways and in depressions.

Runoff is slow, and during periods of heavy rainfall, ponding is likely. Wetness and very slow permeability are the major limitations of this soil for many nonfarm uses. Capability unit IIIw-4; woodland suitability group 2w3.

CcB—Caneadea silt loam, 2 to 6 percent slopes. This is a gently sloping soil on undulating terraces. It has the profile described as representative of the series. Most areas of this soil are 5 to 20 acres in size.

Included in mapping are areas of the poorly drained Canadice soils in shallow drainageways and in depressions. Also included are a few areas that are moderately eroded. These moderately eroded areas commonly have a stickier, more clayey surface layer than uneroded areas and have rapid surface runoff.

Seasonal wetness is the major limitation to farming this soil. However, erosion is a hazard, especially on long slopes. Seasonal wetness and very slow permeability are the major limitations for many nonfarm uses. Capability unit IIIw-4; woodland suitability group 2w3.

Canfield Series

The Canfield series consists of deep, moderately well drained, nearly level to sloping soils that formed in loam and fine sandy loam glacial till. These soils are on uplands in the southeastern and north-central parts of the county.

In a representative profile the surface layer is dark brown silt loam 8 inches thick. The upper part of the subsoil, from a depth of 8 to 22 inches, is firm yellowish brown and dark yellowish brown silt loam and loam that is mottled in the lower part. Between depths of 22 and 46 inches is a very firm, compact, fragipan of mottled dark yellowish brown loam and fine sandy loam. Below this, the lower part of the subsoil and the substratum to a depth of 82 inches are firm dark yellowish brown loam and fine sandy loam.

Canfield soils have a moderately deep root zone and a moderate available water capacity. Permeability is moderate above the fragipan and slow in and below the fragipan. A perched water table is within 2 feet of the surface during wet periods. If the soil is saturated, water tends to flow through it laterally on top of the fragipan.

Canfield soils are commonly used for cultivated crops, but many areas are in residential use or are used as woodland. The main crops are corn, wheat, and grass-legume meadow.

Representative profile of Canfield silt loam, 2 to 6 percent slopes, in Randolph Township, 2 miles northeast of Randolph, 200 feet south of Taylor Road, 500 feet east of New Milford Road (Profile PG-3 in the section "Laboratory Data"):

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate medium and fine granular structure; friable; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.
B1—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; common filled root channels of dark brown (10YR 4/3); 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—11 to 16 inches; yellowish brown (10YR 5/6) loam;

few fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; friable; thin patchy brown (7.5YR 5/4) clay films on ped faces; 5 to 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—16 to 22 inches; dark yellowish brown (10YR 4/4) loam; few fine distinct light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; medium patchy light brownish gray (2.5Y 6/2) clay films on vertical ped faces; thin patchy light brownish gray (2.5Y 6/2) clay films on pores in ped interiors; 5 to 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx1—22 to 30 inches; dark yellowish brown (10YR 4/4) loam; few fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure; very firm and brittle; medium patchy light brownish gray (2.5Y 6/2) clay films on vertical ped faces; a thin rind of yellowish red (5YR 5/6) adjacent to clay films; common black (10YR 2/1) stains in ped interiors; 5 to 10 percent coarse fragments; extremely acid; clear wavy boundary.

Bx2—30 to 38 inches; dark yellowish brown (10YR 4/4) fine sandy loam; few fine distinct very pale brown (10YR 7/3) and strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to moderate thick platy; very firm and brittle; medium patchy light brownish gray (2.5Y 6/2) clay films mainly on vertical ped faces; a thin rind of yellowish red (5YR 5/6) adjacent to clay films; common black (10YR 2/1) stains on horizontal ped faces; extremely acid; clear wavy boundary.

Bx3—38 to 46 inches; dark yellowish brown (10YR 4/4) fine sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure parting to weak thick platy; firm and brittle; coatings on vertical ped faces are light brownish gray (2.5Y 6/2); common black (10YR 2/1) stains on horizontal surfaces; 5 to 10 percent coarse fragments; very strongly acid; gradual smooth boundary.

B3—46 to 59 inches; dark yellowish brown (10YR 4/4) fine sandy loam; few fine distinct light gray (10YR 7/2) and strong brown (7.5YR 5/6) mottles; massive; firm; occasional light brownish gray (2.5Y 6/2) vertical seams; 5 to 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

C1—59 to 69 inches; dark yellowish brown (10YR 4/4) loam; few fine distinct strong brown (7.5YR 5/6) mottles; massive; firm; 5 to 10 percent coarse fragments; medium acid; clear smooth boundary.

C2—69 to 82 inches; dark yellowish brown (10YR 4/4) fine sandy loam; massive; firm; 5 percent coarse fragments; slightly acid.

The solum is 45 to 65 inches thick. The upper part of the solum is strongly acid to extremely acid except where the soil has been limed, and the lower part of the solum and the C horizon are very strongly acid to neutral. Content of coarse fragments ranges from 1 to 5 percent above the fragipan and from 3 to 15 percent in and below the fragipan.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The Bt horizon is dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4-5/6). The polygons or prisms in the fragipan are 5 to 18 inches across. They have gray (10YR 5/1, 5Y 5/1), grayish brown (2.5Y 5/2), or light grayish brown (2.5Y 6/2) coatings throughout. There is a thin yellowish brown (10YR 5/6-5/8), strong brown (7.5YR 5/6, 5/8), or yellowish red (5YR 5/6) rind between the gray zone and the interior of the polygons. The polygon interiors are brown (10YR 4/3) and dark yellowish brown (10YR 4/4). The fragipan and B3 horizon textures include loam, silt loam, and fine sandy loam. The C horizon is dark yellowish brown (10YR 4/4), or brown (10YR 4/3) silt loam, loam, or fine sandy loam.

Canfield soils are the moderately well drained member of a drainage sequence that includes the well drained Wooster soils, the somewhat poorly drained Ravenna soils, and the poorly drained Frenchtown soils. In some areas, Canfield soils are adjacent to Rittman soils. They have less clay in the B horizon than Rittman soils.

CdA—Canfield silt loam, 0 to 2 percent slopes. This is a nearly level soil on hilltops, mainly in areas that range from 5 to 10 acres in size. Slopes are commonly 1 or 2 percent. This soil tends to dry out more slowly in spring than the other Canfield soils. Included in mapping are small areas of the somewhat poorly drained Ravenna soils.

Runoff is slow, and there is little or no erosion. Slow permeability in the lower part of the subsoil and seasonal wetness are the major limitations to some nonfarm uses of this soil. Capability unit IIw-3; woodland suitability group 1o1.

CdB—Canfield silt loam, 2 to 6 percent slopes. Most areas of this gently sloping soil are large and irregular in shape. This soil has the profile described as representative of the series.

Included in mapping are a few areas of the well drained Wooster soils, mainly where the slope ranges from 4 to 6 percent. Also included are small spots of the somewhat poorly drained, less sloping Ravenna soils and a few areas that are moderately eroded and have a plow layer that is a mixture of the original surface layer and some subsoil material.

Where this soil has long slopes, internal water tends to move laterally downslope, coming to the surface as seeps in less sloping areas. Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Seasonal wetness and slow permeability in the lower part of the subsoil are the major limitations for many nonfarm uses. Capability unit IIe-2; woodland suitability group 1o1.

CdC—Canfield silt loam, 6 to 12 percent slopes. This is a sloping soil in uniform areas on valley sides or in complex rolling areas on uplands. Most areas of this soil are wooded. Included in mapping are small areas of the well drained Wooster soils, particularly on the rolling landscapes.

Runoff is rapid, and this soil is more susceptible to erosion than the less sloping Canfield soils. The hazard of erosion is severe if this soil is cultivated. Slope and slow permeability in the lower part of the subsoil are the major limitations for many nonfarm uses. Capability unit IIIe-2; woodland suitability group 1o1.

CdC2—Canfield silt loam, 6 to 12 percent slopes, moderately eroded. This is a sloping soil adjacent to drainageways. Its plow layer consists of a mixture of the original surface layer and some yellowish brown subsoil material. About 50 percent of the original surface layer has been removed by erosion. This soil differs from less eroded Canfield soils by having more pebbles and coarse fragments on the surface and being shallower to the fragipan. As a result of erosion the surface layer is lower in organic matter, the root zone is shallower, and this soil has a lower available water capacity than the uneroded Canfield soils. Included in mapping are areas of the well drained Wooster soils.

Water commonly moves downslope through the soil above the fragipan, and seeps are fairly common on lower slopes. Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. Slope and slow perme-

ability are the major limitations for many nonfarm uses. Capability unit IIIe-2; woodland suitability group 1o1.

CfB—Canfield-Urban land complex, undulating. This mapping unit is 20 to 60 percent undisturbed Canfield soils in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent borrow or fill areas; and 15 to 30 percent areas that are covered by buildings, driveways, and streets. Most areas are used for urban and industrial development, and much of the original soil has been altered or covered as a result of grading and digging operations.

In fill areas, 1 to 3 feet of material covers undisturbed Canfield soils or inclusions of Wooster soils. The fill material consists largely of loamy Canfield subsoil material, and in some places of loamy substratum material from other areas.

In borrow areas, loamy material from the subsoil and substratum of the Canfield soil is exposed.

The surface layer of the disturbed soil commonly has low organic-matter content and poor physical characteristics. It is highly susceptible to puddling. Optimum tillage is possible only within a narrow range of moisture content. The surface layer tends to become hard when dry.

There is a hazard of erosion particularly if the soil is left bare during construction. Seepage is common during wet periods. The fragipan limits some uses that require subsoil excavation. Not assigned to a capability unit; not assigned to a woodland suitability group.

CfC—Canfield-Urban land complex, rolling. This mapping unit is 20 to 60 percent undisturbed Canfield soil in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent borrow or fill areas; and 15 to 30 percent areas that are covered by buildings, driveways, and streets. Most areas are used for urban and industrial development, and much of the original soil has been altered or covered as a result of grading and digging.

In fill areas, 1 to 3 feet of material covers undisturbed Canfield soils or inclusions of Wooster soil. The fill material consists of loamy subsoil and substratum material from other areas. In borrow areas, subsoil and substratum material are exposed.

The surface layer of the disturbed soil commonly has low organic matter content and poor physical characteristics. It tends to become hard when dry.

The hazard of erosion is severe, particularly if the soil is left bare during construction. Runoff is rapid. Seepage is common during wet periods. When the soil is dry, the material in the fragipan is difficult to excavate. Not assigned to a capability unit; not assigned to a woodland suitability group.

Carlisle Series

The Carlisle series consists of very poorly drained organic soils (fig. 3) that formed in muck and peat deposits more than 51 inches thick. These soils are in broad low bogs or kettles mostly in the western part of the county.

In a representative profile the upper 17 inches is black friable muck. Below this, to a depth of 60 inches is dark brown, well decomposed, friable muck.

Carlisle soils have a very shallow root zone unless they are drained, and they have a very high available water capacity. Permeability is moderately rapid. The water table is at or near the surface unless the soils have been drained.

Some areas of Carlisle soils have been drained and are used for vegetables and special crops. Undrained areas are in swamp grasses or in woodland.

Representative profile of Carlisle muck, in Brimfield Township, about 3,000 feet east of Sunny Road, 100 feet south of old Forge Road:

Oa1—0 to 3 inches; black (10YR 2/1) broken face and rubbed sapric material; no fiber; moderate medium granular structure; friable; strongly acid (in water); clear smooth boundary.

Oa2—3 to 13 inches; black (10YR 2/1) broken face and rubbed sapric material; less than 5 percent fiber, no fiber rubbed; weak coarse prismatic structure parting to weak coarse angular blocky; friable; medium acid (in water); clear smooth boundary.

Oa3—13 to 17 inches; black (10YR 2/1) broken face and rubbed sapric material; less than 5 percent fiber, no fiber rubbed; massive; friable; medium acid (in water); clear smooth boundary.

Oa4—17 to 25 inches; dark brown (7.5YR 3/2), sapric material, black (10YR 2/1) rubbed; 5 to 10 percent fiber, no fiber rubbed; massive; friable; medium acid (in water); clear smooth boundary.

Oa5—25 to 29 inches; dark brown (7.5YR 3/2) sapric material, very dark brown (10YR 2/2) rubbed; about 15 percent fiber, about 2 percent fiber rubbed; massive; friable; medium acid (in water); clear smooth boundary.

Oa6—29 to 47 inches; dark brown (7.5YE 3/2) sapric material, very dark brown (10YR 2/2) rubbed; 15 to 20 percent fiber, about 5 percent fiber rubbed; massive; friable; medium acid (in water); clear smooth boundary.

Oa7—47 to 60 inches; dark brown (7.5YR 3/2) sapric material, very dark brown (10YR 2/2) rubbed; about 30 percent fiber, 5 to 10 percent fiber rubbed; massive; friable; neutral (in water).

The organic material is more than 51 inches thick. Reaction of the subsurface tier is medium to strongly acid (in water). The surface tier is black (10YR 2/1) or very dark brown (10YR 2/2) and is dominantly sapric material. The subsurface tier is dominantly very dark brown (10YR 2/2) or dark brown (7.5YR 3/2), and the rubbed color is very dark brown (10YR 2/2) or black (10YR 2/1). The subsurface tier is dominantly sapric material and has a rubbed fiber content of less than 10 percent. Wood fragments are common below a depth of 26 inches. Color in the bottom tier is similar to the subsurface tier.

The Carlisle soils are on landscape positions similar to very poorly drained Linwood, Holly, and Olmsted soils. Carlisle soils are deeper to mineral material than the Linwood soils. They are organic, whereas Olmsted soils are mineral.

Cg—Carlisle muck. This soil is in level to depressional areas that are variable in size. It is commonly difficult to drain, and in some areas natural drainage outlets are not available.

Included in mapping are small areas of Linwood soils and a few areas that have an overwash of mineral material 6 to 10 inches thick.

Carlisle soils in Mantua Township along Black Brook have inclusions of soils that are underlain by sedimentary peat between depths of 29 and 51 inches. These soils make up about 20 percent of the mapped areas.

Wetness is a major limitation to the use of this soil. The soil is subject to subsidence if drained and is highly unstable if used for structures. Drained areas, if dry, are subject to both severe soil blowing and

Figure 3.—**Carlisle muck, when drained, is suited to special crops such as sod. These rolls of sod have been cut for hauling to sites where a grass cover is needed.**

damage by fire. Crop production on this soil requires intensive management, but the soil is well suited to vegetable or sod production, if it is drained. Capability unit IIIw-2; not assigned to a woodland suitability group.

Chili Series

The Chili series consists of deep, well drained, nearly level to very steep loamy soils (fig. 4) that formed in loamy material underlain by sand and gravel. These soils are on outwash terraces and kames.

In a representative profile the surface layer is dark brown loam 9 inches thick. The upper part of the subsoil, between depths of 9 and 20 inches, is dark yellowish brown loam. The lower part of the subsoil, which extends to a depth of 54 inches, is brown and dark yellowish brown gravelly clay loam and very gravelly sandy loam. The substratum to a depth of 70 inches is dark yellowish brown gravelly sand.

Chili soils have a moderately deep root zone in most places and a low to moderate available water capacity. Permeability is moderately rapid in the subsoil and very rapid in the substratum. These soils tend to be droughty in periods of low rainfall.

Chili soils are used equally for cultivated crops, woodland, and nonfarm uses. If they are cultivated, the main crops are corn, wheat, and grass-legume meadow.

Representative profile of Chili loam, 2 to 6 percent slopes, in Shalersville Township, 2,100 feet east of Frost Road, 2,200 feet south of Dudley Road, and 2,000 feet west of Infirmary Road:

Ap—0 to 9 inches; dark brown (10YR 4/3) loam; moderate medium granular structure; friable; 2 percent gravel; neutral; abrupt smooth boundary.

B1—9 to 14 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; 2 percent gravel; neutral; gradual smooth boundary.

B21t—14 to 20 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; firm; thin patchy clay films in pores; 2 percent gravel; slightly acid; clear smooth boundary.

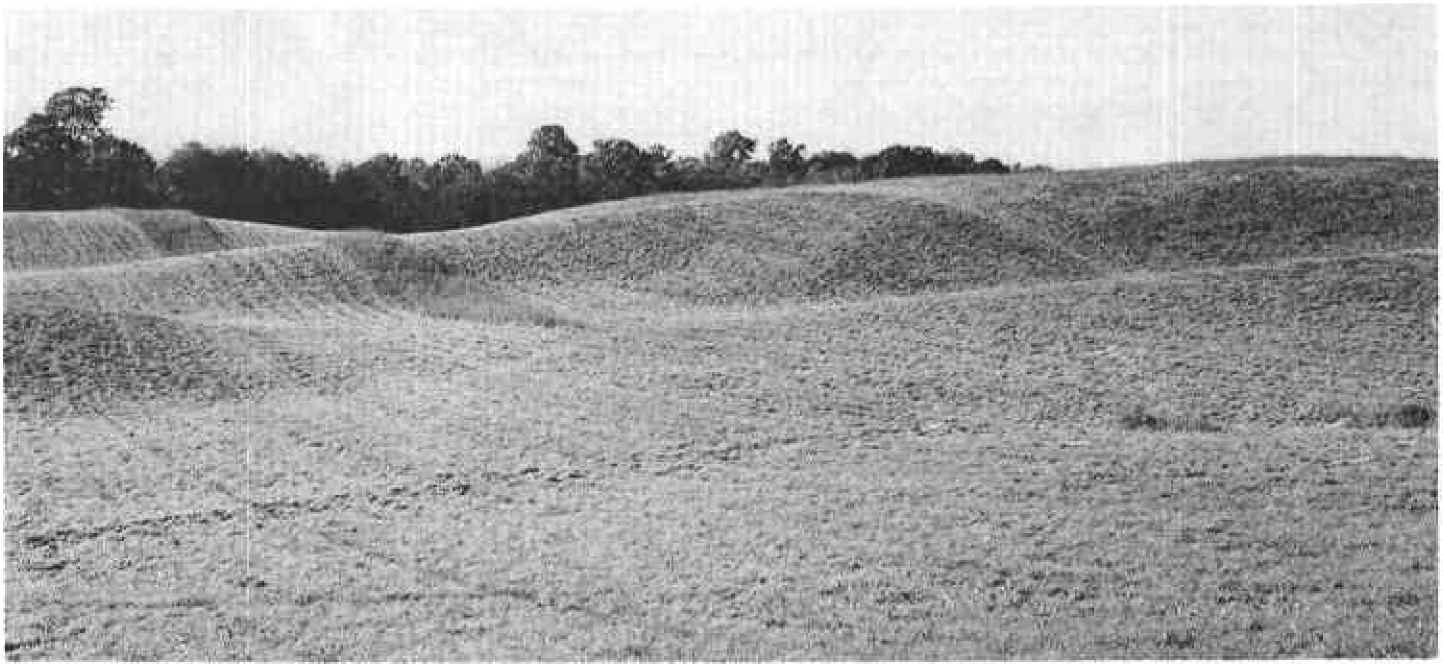


Figure 4.—**Hay crop on a Chili-Wooster complex. These soils are well drained and erodible. They are well suited to grasses and legumes.**

B22t—20 to 35 inches; brown (7.5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on ped faces and coating pebbles; 25 percent gravel; medium acid; gradual smooth boundary.

IIB3—35 to 54 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; massive; friable; thin very patchy clay films on gravel; about 50 percent gravel; strongly acid; gradual wavy boundary.

IIC—54 to 70 inches; dark yellowish brown (10YR 4/4) gravelly sand; single grained; loose; about 50 percent gravel; medium acid.

The solum is 40 to 60 inches thick. The upper part of the solum is strongly acid or very strongly acid unless limed, and the lower part of the solum and the C horizon are strongly acid to medium acid.

The Ap horizon has a hue of 7.5YR or 10YR, value of 4, and chroma of 2 or 3. In undisturbed areas the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) and is 1 to 5 inches thick. The A2 horizon is 0 to 5 inches thick and has a chroma of 3 or 4 and value of 4 or 5. The A horizon is silt loam, loam, sandy loam, or gravelly loam.

The B horizon has a hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 6. The upper part of the B3t horizon is loam, silt loam, heavy sandy loam, clay loam, or sandy clay loam and their gravelly analogs. The lower part of the Bt horizon is gravelly or very gravelly sandy loam or loam, and typically has more than 20 percent gravel. The C horizon is brown (10YR 4/3) or dark yellowish brown (10YR 4/4), and it consists of stratified sands and gravel.

Chili soils are the well drained member of a drainage sequence that includes the moderately well drained Bogart soils, somewhat poorly drained Jimtown soils, poorly drained Damascus soils, and very poorly drained Olmsted soils. They are commonly near Bogart, Jimtown, Oshtemo, Wheeling, and Lakin soils. Chili soils have less silt and more gravel in the B horizon than Wheeling soils. They have more clay and gravel in the B horizon than Oshtemo soils. They are less gray in the B horizon than Bogart and Jimtown soils. Chili soils are less sandy than Lakin soils and lack the banding in the B horizon that is characteristic of the Lakin soils.

CnA—Chili loam, 0 to 2 percent slopes. This is a nearly level soil on terraces. Areas are about 20 to 50 acres in size. Included in mapping are areas of the moderately well drained Bogart soils in low areas and small areas that have a gravelly surface layer.

Runoff is slow, and water moves readily into this soil. Droughtiness is the major limitation to the use of this soil for crops. It has few limitations for most nonfarm uses. Capability unit IIs-1; woodland suitability group 2o1.

CnB—Chili loam, 2 to 6 percent slopes. This soil is on outwash plains and stream terraces. Areas of this soil are slightly convex and vary in size and shape. This soil has the profile described as representative of the series.

Included in mapping are small moderately eroded, more sloping areas that have a gravelly surface layer.

Runoff is moderate. Although this soil absorbs water readily, the hazard of erosion is moderate in cultivated areas. This soil has few limitations other than slope for most nonfarm uses. Capability unit IIe-4; woodland suitability group 2o1.

CnC—Chili loam, 6 to 12 percent slopes. This is a sloping soil in rolling areas on terraces and kames. Some areas are on short slope breaks.

Included in mapping are some eroded areas where the plow layer is a mixture of the original surface layer and subsoil material. Also included are a few small areas of Bogart soils.

Runoff is medium to rapid, and the hazard of erosion is severe if this soil is cultivated. Droughtiness is a limitation during dry periods in summer. Slope is the

major limitation of this soil for nonfarm uses. Capability unit IIIe-3; woodland suitability group 2o1.

CoC2—Chili gravelly loam, 6 to 12 percent slopes, moderately eroded. This soil is on crests of knolls and along the edge of terraces. Areas vary in size and shape. This soil has a profile similar to the one described as representative of the series, but its surface layer and subsoil contain more sand and gravel.

Included in mapping are small areas of Oshtemo and Bogart soils.

Runoff is medium, and the hazard of erosion is severe if cultivated crops are grown. This soil has a lower available water capacity than Chili loam or silt loam, and water moves into the surface layer readily. Slope is the major limitation to the use of this soil for nonfarm uses. Capability unit IIIe-3; woodland suitability group 2o1.

CpA—Chili silt loam, 0 to 2 percent slopes. The surface layer and upper part of the subsoil have more silt than is described as representative of the series. This soil has a slightly higher available water capacity than Chili loam soils, but it is more subject to crusting.

Included in mapping are a few small areas of Wheeling soils that are less droughty.

Runoff is slow, and water moves readily into this soil. Droughtiness is the major limitation to the use of this soil for farming; however, this is the least droughty Chili soil in the county. It has few limitations for most nonfarm uses. Capability unit IIs-1; woodland suitability group 2o1.

CpB—Chili silt loam, 2 to 6 percent slopes. This is a gently sloping soil on undulating terraces. Most areas of this soil are irregular in shape and variable in size. The surface layer and upper part of the subsoil have more silt than is described as representative of the series. Because it has more silt in the upper part of the profile, this soil has a higher available water capacity than Chili loam or Chili gravelly loam and the surface layer has a greater tendency to crust.

Included in mapping are small moderately eroded areas mainly on the more sloping positions. Also included are a few small areas of Wheeling soils.

Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Other than slope, this soil has few limitations for most nonfarm uses. Capability unit IIe-4; woodland suitability group 2o1.

CpC—Chili silt loam, 6 to 12 percent slopes. This is a soil that occurs along drainageways and on low knolls and hills. The surface layer and upper part of the subsoil have more silt than is described as representative of the series. This soil is susceptible to surface crusting. It is more droughty than the less sloping Chili silt loams. It has a higher available water capacity than Chili loam.

Included in mapping are moderately eroded soils that have gravel on the surface and that are lighter colored than this soil. Also included are a few small areas of Wheeling soils.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. Slope is the major limitation to most nonfarm uses of this soil. Capability unit IIIe-3; woodland suitability group 2o1.

CtD—Chili-Oshtemo complex, 12 to 18 percent slopes. These are moderately steep soils on hilly kames, mostly in the southwestern part of the county. The surface layer is loam, sandy loam, and gravelly loam.

The Chili and Oshtemo soils in this complex are so closely intermingled that it is not practical to map them separately. This complex is 40 to 70 percent Chili soils and 30 to 50 percent Oshtemo soils. However, the relative proportion of these soils varies from area to area.

Included with these soils in mapping are a few spots that have 30 to 40 percent gravel in the subsoil. These spots are more droughty than the other soils in this complex. Also included are some areas that are moderately eroded.

Although these soils can be used occasionally for cultivated crops, they are best suited to pasture. The hazard of erosion is severe if the soils are cultivated. Some areas are used as a source of gravel and sand for roads and concrete. Slope is the major limitation to most nonfarm uses of these soils. Capability unit IVe-3; woodland suitability group 3s2.

CtE—Chili-Oshtemo complex, 18 to 25 percent slopes. These are steep soils on hilly kames mainly in the southwestern part of the county. Most areas are in woodland. The surface layer is loam and sandy loam, and some areas are gravelly.

The Chili and Oshtemo soils are so closely intermingled that it is not practical to map them separately. This complex is 40 to 70 percent Chili soils and 30 to 50 percent Oshtemo soils. However, the relative proportion of these soils varies from area to area.

Included in mapping are a few areas that have 30 to 40 percent gravel in the subsoil. These areas are more droughty than the other soils in this complex. Also included are some moderately eroded areas.

These steep soils are susceptible to erosion and are difficult to cultivate. The hazard of erosion is very severe if they are cultivated.

Slope is the major limitation to most farm and nonfarm uses of these soils. Capability unit VIe-2; woodland suitability group 3s2.

CtF—Chili-Oshtemo complex, 25 to 50 percent slopes. These are very steep soils on kames and on the sides of valleys, mainly in the southwestern part of the county adjacent to the Cuyahoga River. Most areas are wooded. The surface layer is loam and sandy loam, and some areas are gravelly.

In some areas Chili and Oshtemo soils are so closely intermingled that it is not practical to map them separately. This complex is 40 to 70 percent Chili soils and 30 to 50 percent Oshtemo soils; however, the relative proportion varies from area to area.

Included in mapping are a few areas where the subsoil is 30 to 40 percent gravel. These spots are more droughty than the other soils in this complex. Also included are some moderately eroded areas.

Slope and droughtiness are the major limitations to the use of these soils for farming, and slope is the major limitation for nonfarm uses. Capability unit VIIe-2; woodland suitability group 3s3.

CnB—Chili-Urban land complex, uudulating. This is a nearly level and gently sloping mapping unit that consists of 20 to 60 percent undisturbed Chili soils in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent borrow or fill areas; and 15 to 30 percent areas that are covered by

buildings, driveways, and streets. Most areas are used for urban and industrial development, and much of the original soil has been altered or covered as a result of grading and digging.

In fill areas, 1 to 3 feet of material covers mainly Chili soil. The fill material consists of loamy Chili subsoil material, and in some places, gravelly material from other areas.

In borrow areas, subsoil material and underlying sand and gravel are exposed.

The surface layer of the disturbed soil commonly has low organic matter content and poor tilth. It is droughty and forms a poor seedbed. A severe hazard of erosion exists, particularly if the soil is left bare during construction. Bare areas produce high amounts of runoff and sediment.

Except that droughtiness limits its use for landscaping, this mapping unit has few limitations for most nonfarm uses. Not assigned to a capability unit; not assigned to a woodland suitability group.

CuC—Chili-Urban land complex, rolling. This is a sloping to moderately steep mapping unit on a rolling landscape. About 20 to 60 percent is mainly undisturbed Chili soils in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent is borrow or fill areas; and 15 to 30 percent is covered by buildings, driveways, and streets. Most areas are used for urban and industrial development, and much of the soil has been altered or covered as a result of grading and digging.

In fill areas, 1 to 3 feet of material covers mainly Chili soils. The fill material consists of loamy Chili subsoil material and, in some places, gravelly substratum material. In borrow areas, material from the subsoil and substratum are exposed.

The surface layer of the disturbed soil commonly has low organic-matter content and poor tilth. It is droughty and forms a poor seedbed. There is a severe hazard of erosion, particularly if the soil is left bare during construction. Runoff is severe, and large amounts of sediment are carried to adjacent drainageways and lower lying areas. Slope is the major limitation to most nonfarm uses of these soils. Not assigned to a capability unit; not assigned to a woodland suitability group.

CwC2—Chili-Wooster complex, 6 to 12 percent slopes, moderately eroded. This is a complex on rolling hummocky uplands, mainly in the southwestern part of the county. Slopes are typically short and irregular.

Areas of this complex contain both Chili and Wooster soils that are so closely intermingled that it is not practical to map them separately. This complex is about 40 to 50 percent Chili soils and 20 to 30 percent Wooster soils.

Included in mapping in most areas are Wheeling, Ellsworth, and Glenford soils. They comprise 10 to 30 percent of the area. The Wooster soils in this complex have a less developed fragipan than Wooster soils mapped elsewhere in the county. Small circular dry depressions are common in most areas.

The material underlying these soils is variable, ranging from till to stratified layers of silt, sand, and gravel within short horizontal distances. Pebbles and stones in the soil range from few to many, and there are scattered large boulders. The surface layer is commonly loam but ranges to silt loam, sandy loam, and gravelly loam.

In most areas half or more of the original surface layer has been removed by erosion. The plow layer consists of a mixture of the original surface layer and subsoil material. As a result of erosion, the soils absorb water less rapidly, more water is lost by runoff, and the plow layer is subject to crusting that may interfere with emergence of seedlings. Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated.

Some areas are potential sources of roadfill, sand, and gravel, but in most places the underlying material contains too much silt to be suitable for concrete. Slope is the major limitation to most nonfarm uses of these soils. Capability unit IIIe-3; woodland suitability group 2o1.

CwD2—Chili-Wooster complex, 12 to 18 percent slopes, moderately eroded. These are moderately steep soils in hummocky areas mainly in the southwestern part of the county. Slopes are typically short and irregular in shape.

Areas of this complex contain Chili and Wooster soils in such an intricate pattern that it is not practical to map them separately. This complex is about 40 to 50 percent Chili soils and 20 to 30 percent Wooster soils.

Included in mapping in most areas are Wheeling, Ellsworth, and Glenford soils. The Wooster soils in this complex have a less developed fragipan than those mapped elsewhere in the county. Small circular dry depressions are common in most areas.

The material underlying these soils is variable, ranging from till to stratified layers of silt, sand, and gravel within short horizontal distances. Pebbles and stones in the soil range from few to many, and there are scattered large boulders. The surface layer is commonly loam, but it ranges to silt loam, sandy loam, and gravelly loam.

The surface layer in most areas is a mixture of subsoil and remnants of the original surface layer. In a few areas, the surface layer is mainly subsoil material. Runoff is high. A very severe hazard of erosion, slope, and droughtiness are the major limitations to the use of these soils for cultivated crops.

Some areas are potential sources of roadfill and sand and gravel, but in most areas, the underlying material contains too much silt to be suitable for concrete. Moderately steep slopes are the major limitation for most nonfarm uses of the soils. Capability unit IVe-3; woodland suitability group 2r1.

CwE—Chili-Wooster complex, 18 to 30 percent slopes. These are steep soils on side slopes along drainageways. These soils are mainly wooded.

Areas of this complex contain Chili and Wooster soils so intricately intermingled that it is not practical to map them separately. This complex is about 40 to 50 percent Chili soils and 20 to 30 percent Wooster soils.

Included in mapping in most areas are Wheeling, Ellsworth, and Glenford soils. Also included are areas that are very steep and areas that are moderately eroded.

The material underlying these soils is variable, ranging from till to stratified layers of silt, sand, and

gravel within short horizontal distances. Pebbles and stones in the soil range from few to many, and there are scattered large boulders. The surface layer is commonly loam, but it includes silt loam, sandy loam, and gravelly loam. The Wooster soils in this complex have a less developed fragipan than those mapped elsewhere in the county.

Runoff is rapid where trees have been cleared. These soils are generally too steep to be suited to cultivated crops, but they are suited to pasture and woodland.

Some areas are potential sources of roadfill, sand, and gravel, but in most areas the underlying material contains too much silt to be suitable for concrete. Steepness is the major limitation for most nonfarm uses. Capability unit VIe-2; woodland suitability group 2r1.

Damascus Series

The Damascus series consists of deep, poorly drained, nearly level soils that formed in sandy and loamy outwash material. These soils are on low-lying outwash terraces throughout the county.

In a representative profile the surface layer is very dark grayish brown loam 9 inches thick. The subsoil extends to a depth of 39 inches. It is friable light brownish gray sandy loam to a depth of 15 inches, and below this to a depth of 39 inches, it is gray or dark gray gravelly loam and gravelly sandy clay loam. The substratum to a depth of 60 inches is loose loamy sand, gravelly sand, and very gravelly sand.

Damascus soils have a moderately deep root zone if they are drained, and they have a moderate available water capacity. They have a high water table in winter, spring, and early in summer. Permeability is moderate to moderately rapid in the subsoil and rapid in the substratum.

Damascus soils are mainly in woodland or brush. Some areas have been cleared of trees, but few are cultivated because most areas have not been artificially drained. Artificial drainage is necessary for optimum production of cultivated crops.

Representative profile of Damascus loam, in Nelson Township, 165 feet south of Knowlton Road, about 2,000 feet west of the Trumbull County line:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) when rubbed; moderate fine and medium granular structure; friable; 2 percent fine gravel; strongly acid; abrupt smooth boundary.

B1g—9 to 15 inches; light brownish gray (2.5Y 6/2) sandy loam; common coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; 5 percent fine gravel; slightly acid; clear smooth boundary.

B21gt—15 to 22 inches; gray (5Y 5/1) gravelly loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; medium patchy gray (5YR 5/1) clay films coating pores and bridging sand grains; 15 to 20 percent fine gravel; medium acid; clear smooth boundary.

B22gt—22 to 29 inches; dark gray (5Y 4/1) gravelly sandy clay loam; common coarse distinct dark yellowish brown (10YR 4/4) and common fine distinct dark brown (7.5YR 4/4) mottles; massive; friable; medium patchy clay films bridging sand grains; 15 to 20 percent gravel; medium acid; clear smooth boundary.

B3g—29 to 39 inches; dark gray (5Y 4/1) gravelly sandy clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; thin very patchy clay films bridging sand grains; about 20 percent gravel; slightly acid; abrupt smooth boundary.

C1—39 to 44 inches; gray (5Y 5/1) loamy sand; single grained; loose; about 10 percent gravel; slightly acid; clear smooth boundary.

C2—44 to 54 inches; grayish brown (2.5Y 5/2) gravelly sand; common coarse distinct yellowish brown (10YR 5/6) mottles; single grained; neutral; clear smooth boundary.

C3—54 to 60 inches; dark gray (5Y 4/1) very gravelly sand; few coarse distinct dark yellowish brown (10YR 4/4) mottles; single grained; loose; neutral.

The solum is 30 to 42 inches thick. The content of gravel is 0 to 30 percent in horizons above a depth of 20 inches and is 10 to 30 percent in individual horizons between depths of 20 and 40 inches. The solum is very strongly acid to slightly acid except where the soil has been limed. The C horizon is strongly acid to slightly acid; reaction changes to slightly acid or neutral as depth increases.

The Ap horizon has rubbed colors ranging from gray (5Y 5/1) to dark grayish brown (10YR 4/2, 2.5Y 4/2). The A1 horizon, if present, is very dark gray (10YR 3/1) through black (10YR 2/1), and is 1 to 5 inches thick. The A2 horizon is gray (10YR 5/1) through light brownish gray (2.5Y 6/2) and is 1 to 8 inches thick. The Btg horizon has a hue of 2.5Y or 5Y, value of 4 through 6, and chroma of 0 through 2. It is typically sandy clay loam or loam or gravelly analogs of these textures, and it has thin subhorizons of sandy loam, silt loam, or light clay loam. The C horizon is gray (5Y 5/1), grayish brown (2.5Y 5/2), or dark gray (5Y 4/1) and ranges from gravelly loam or very gravelly loam to loamy sand or sand.

Damascus soils are the poorly drained member of a drainage sequence that includes the well drained Chili soils, the moderately well drained Bogart soils, the somewhat poorly drained Jimtown soils, and the very poorly drained Olmsted soils. They are commonly adjacent to Olmsted and Sebring soils. The Damascus soils have a lighter colored A horizon than Olmsted soils. Damascus soils have less silt and more sand in the Bt and C horizons than Sebring soils.

Da—Damascus loam. This is a nearly level soil on outwash terraces. Included in mapping are small areas of dark-colored, very poorly drained Olmsted soils in low depressions and some small areas of Sebring soils.

Runoff is slow to ponded. The hazard of wetness is severe if this soil is cultivated. The seasonal high water table is the major limitation for most nonfarm uses. Capability unit IIIw-3; woodland suitability group 2w2.

Dekalb Series

The Dekalb series consists of moderately deep, well drained, gently sloping to very steep, channery soils that formed in residuum of coarse grained acid sandstone. These soils are on escarpments at the higher elevations throughout the county.

In a representative profile the surface layer is dark grayish brown channery loam about 2 inches thick. The subsoil is brown channery loam to a depth of 6 inches. Below this, to a depth of 23 inches, it is yellowish brown and dark yellowish brown channery fine sandy loam. The substratum is yellowish brown very flaggy loamy sand. Hard sandstone bedrock is at a depth of 33 inches.

Dekalb soils have a moderately deep root zone and a low available water capacity. Permeability is rapid above the sandstone bedrock.

Most areas are wooded. A few areas are used as pasture.

Representative profile of Dekalb channery loam, 12 to 25 percent slopes, in a wooded area in Palmyra Township, 650 feet north of Fisher Road, 50 feet west of Thomas Road:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) channery loam; weak fine granular structure; friable; 15 percent sandstone fragments; strongly acid; clear wavy boundary.

B1—2 to 6 inches; brown (10YR 4/3) channery loam; weak fine subangular blocky structure; friable; 15 percent sandstone fragments; very strongly acid; clear smooth boundary.

B21—6 to 14 inches; yellowish brown (10YR 5/4) channery fine sandy loam; moderate medium subangular blocky structure; friable; about 20 percent sandstone fragments; very strongly acid; clear smooth boundary.

B22—14 to 23 inches; dark yellowish brown (10YR 4/4) channery fine sandy loam; moderate medium subangular blocky structure; firm; about 40 percent sandstone fragments; very strongly acid; clear irregular boundary.

C—23 to 33 inches; yellowish brown (10YR 5/4) very flaggy loamy sand; single grained; loose; about 80 percent sandstone flagstones; very strongly acid; gradual irregular boundary.

R—33 inches; sandstone bedrock.

The solum is 20 to 30 inches thick. Depth to bedrock is 20 to 40 inches. Reaction is very strongly acid or strongly acid throughout the profile if the soil is unlimed. Content of coarse fragments ranges from 15 to 35 percent in the upper part of the B horizon, 40 to 60 percent in the lower part of the B horizon, and is as much as 90 percent in the C horizon, where present.

The A1 horizon is 2 to 5 inches thick and is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or very dark brown (10YR 2/2). An A2 horizon is in some profiles. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 5. It is loam, sandy loam, or fine sandy loam or channery or very channery analogs of those textures.

Dekalb soils are on landscapes similar to those occupied by Loudonville soils. They are coarser textured and have a higher proportion of coarse fragments throughout the profile than Loudonville soils.

DkB—Dekalb channery loam, 2 to 6 percent slopes. This is a gently sloping soil on the upper part of hillsides. It is commonly adjacent to areas of moderately well drained Rittman and Ellsworth soils and well drained Loudonville soils. Included in mapping are spots of Loudonville soils.

Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Stoniness may present some problems in tillage. Moderate depth to bedrock is a limitation to some nonfarm uses of this soil. Capability unit IIe–3; woodland suitability group 3o1.

DkC—Dekalb channery loam, 6 to 12 percent slopes. This is a sloping soil in elongated areas on the upper part of hillsides. Slopes are generally short and are rarely more than 200 to 300 feet in length.

Included with this soil in mapping are small areas of Loudonville soils that are slightly deeper to bedrock. Also included are a few small areas that are moderately eroded.

Runoff is medium to rapid, and the hazard of erosion is severe if this soil is cultivated. Seeps or springs are along the lower slopes in some areas. Slope and limited depth to bedrock are limitations for some nonfarm uses of this soil. Capability unit IIIe–5; woodland suitability group 3o1.

DkD—Dekalb channery loam, 12 to 25 percent slopes. This is a moderately steep to steep soil in narrow strips on hillsides. It has the profile described as representative of the series. Slopes are generally short and are rarely more than 200 to 300 feet in length.

Included with this soil in mapping are spots of Loudonville soils and a few areas that are moderately eroded. Outcrops of sandstone ledges are as much as 5 percent of the acreage. Springs commonly are along the lower slopes.

Runoff is rapid on this soil. Because of steepness and a very severe hazard of erosion, this soil is used mostly for woodland or pasture. Slope and a moderate depth to bedrock are limitations for most nonfarm uses. Capability unit VIe–2; woodland suitability group 3r1.

DkF—Dekalb channery loam, 25 to 70 percent slopes. This is a very steep soil on elongated escarpments. Areas are commonly less than 200 to 300 feet in width and may be as much as several miles in length. Most areas are wooded.

Included with this soil in mapping, and making up as much as 30 percent of the acreage, are outcrops of sandstone ledges. Springs are along the lower slopes in most areas. Small areas of sandstone colluvium, 1 to 2 acres in size, at the base of the escarpments are included in some areas. The colluvium, which has many large rocks on the surface, is deeper to bedrock than this soil. Also included in mapping are some moderately eroded areas.

Runoff is rapid. Because of steepness, this soil is better suited to trees than pasture. Slope and a moderate depth to bedrock are the major limitations to most nonfarm uses of this soil. Capability unit VIIe–2; woodland suitability group 3r2.

Ellsworth Series

The Ellsworth series consists of deep, moderately well drained, gently sloping to very steep soils that formed in silty clay loam and silty clay glacial till. These soils are on uplands in the northwestern and eastern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. The subsoil, which extends to a depth of 32 inches, is mottled yellowish brown, dark yellowish brown, dark grayish brown, and dark brown silty clay loam and silty clay. The substratum to a depth of 60 inches is olive brown silty clay loam and silty clay glacial till.

Ellsworth soils have a moderately deep root zone and a moderate available water capacity. Permeability is slow in the subsoil and in the underlying glacial till. These soils are saturated with water for periods in winter and spring and are slow to dry out in spring.

Most areas are not cultivated. Some areas are pastured or wooded. Cultivated areas are used for meadow, wheat, and corn.

Representative profile of Ellsworth silt loam, 2 to 6 percent slopes, in Edinburg Township, 1.25 miles northwest of Edinburg, 100 feet northeast of State Route 14, 2,525 feet south of Booth Road (Profile PG–7 in the section "Laboratory Data"):

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; fri-

able; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—9 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; few medium distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; firm; thin very patchy clay films on ped faces; one percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—13 to 21 inches; dark yellowish brown (10YR 4/4) silty clay; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; firm; light brown (7.5YR 6/4) coatings on peds; thin patchy clay films on ped faces and in pores; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—21 to 27 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct grayish brown (2.5Y 5/2) mottles and few medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; gray (5Y 6/1) coatings on ped face; thin patchy clay films on ped faces and in pores; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B3—27 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct light gray (5Y 6/1) and gray (N 5/0) mottles; weak coarse prismatic structure; firm; light brownish gray (2.5Y 6/2) coatings on ped faces; patchy clay films on vertical ped faces; medium acid; clear wavy boundary.

C1—32 to 47 inches; olive brown (2.5Y 4/4) silty clay loam; weak thick platy structure; firm; 2 to 5 percent coarse fragments; neutral; clear wavy boundary.

C2—47 to 60 inches; olive brown (2.5Y 4/4) silty clay; weak thick platy structure; firm; 5 percent coarse fragments; light gray (2.5Y 7/2) lime segregations; mildly alkaline and calcareous.

The solum is 28 to 46 inches thick. Content of coarse fragments ranges from 1 to 10 percent. The upper part of the solum is strongly acid to very strongly acid, except where the soil has been limed. The lower part of the B horizon and the C horizon are medium acid to mildly alkaline.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 4/3). In uncultivated and uneroded areas, there is a very dark grayish brown (10YR 3/2) A1 horizon 3 to 4 inches thick. The B1 horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4). The B2 horizon is yellowish brown (10YR 5/4), brown (10YR 4/3), and dark yellowish brown (10YR 4/4) silty clay and silty clay loam.

Ellsworth soils are the moderately well drained member of a drainage sequence that includes the somewhat poorly drained Mahoning soils and poorly drained Trumbull soils. Ellsworth soils are commonly adjacent to Rittman, Mahoning, Geeburg, and Glenford soils. They have more clay in the B and C horizons than Rittman soils, and lack the fragipan characteristic of Rittman soils. They are not so clayey as Geeburg soils and contain more coarse fragments. Ellsworth soils contain more clay and coarse fragments and less silt in the B and C horizons than Glenford soils.

ElB—Ellsworth silt loam, 2 to 6 percent slopes. This is a gently sloping soil on knolls or side slopes parallel to drainageways. It has the profile described as representative of the series.

Included in mapping are small areas of the wetter, somewhat poorly drained Mahoning soils. These are mainly less sloping areas where water from surrounding slopes accumulates. Also included are moderately eroded spots that have a stickier, more clayey surface layer than the uneroded areas.

Runoff is medium, and the hazard of erosion is severe if this soil is cultivated. Seasonal wetness and slow permeability are major limitations of this soil for many nonfarm uses. Capability unit IIIe–4; woodland suitability group 3o1.

ElB2—Ellsworth silt loam, 2 to 6 percent slopes, moderately eroded. This soil has a profile similar to the one described as representative of the series, but the surface layer and the subsoil are thinner as the result of past erosion. Much of the original surface layer has been lost through erosion, and the present surface layer contains some material from the upper part of the subsoil. The surface layer has less organic matter and more clay than uneroded Ellsworth soils. It is sticky, difficult to till, and very susceptible to crusting.

Runoff is medium, and the hazard of erosion is severe if this soil is cultivated. Seasonal wetness and slow permeability are major limitations of this soil for many nonfarm uses. Capability unit IIIe–4; woodland suitability group 3o1.

ElC—Ellsworth silt loam, 6 to 12 percent slopes. This is a sloping soil mainly on side slopes parallel to drainageways. Included in mapping are small areas of the somewhat poorly drained Mahoning soils, particularly where there are long slopes broken by less sloping areas.

Runoff is rapid, and the hazard of erosion is very severe if this soil is cultivated. Slow permeability, seasonal wetness, and slope are the major limitations to most nonfarm uses of this soil. Capability unit IVe–1; woodland suitability group 3o1.

ElC2—Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded. This is a sloping soil adjacent to drainageways and on moraines. It has a profile similar to the one described as representative of the series except it is moderately eroded. The present surface layer is a mixture of original surface layer material and some of the more clayey yellowish brown upper part of the subsoil. In a few areas the plow layer is mainly sticky yellowish brown subsoil material. There are some shallow rills and gullies 6 to 12 inches deep. Shallow drainageways in this soil remain wet in spring after the adjoining soil has dried out.

The surface layer is sticky and difficult to till. It becomes cloddy if tilled when too wet. Runoff is rapid, and the hazard of erosion is very severe if this soil is cultivated. Slow permeability and slope are the major limitations to many nonfarm uses of this soil. Capability unit IVe–1; woodland suitability group 3o1.

ElD2—Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded. This is a moderately steep soil on side slopes along drainageways. Most of the cleared areas are moderately eroded; wooded areas are slightly eroded or uneroded. The surface layer in eroded areas is a mixture of the original surface layer and some subsoil material. It is sticky and difficult to till.

Runoff is rapid to very rapid. Slope and slow permeability are the major limitations to most nonfarm uses of this soil. Capability unit VIe–1; woodland suitability group 3r1.

ElE2—Ellsworth silt loam, 18 to 40 percent slopes, moderately eroded. This is a steep to very steep soil on side slopes along major drainageways. It has a thinner, more eroded profile than that described as representative of the series.

Included in mapping are some areas that have less

clay in the subsoil and underlying material than is typical for Ellsworth soils.

Runoff is very rapid. Downslope slippage is a problem in areas not protected by permanent vegetation. Slope is the major limitation to nonfarm uses of this soil. Capability unit VIIe-1; woodland suitability group 3r1.

EsB—Ellsworth silt loam, sandstone substratum, 2 to 6 percent slopes. This is a gently sloping soil in areas in Aurora Township. It has sandstone bedrock at a depth of 40 to 60 inches.

Included in mapping are some areas where depth to bedrock is more than 60 inches. Also included are a few areas where slope is more than 6 percent and areas that are moderately eroded.

A severe hazard of erosion is the major limitation to the use of this soil for cultivated crops. Slow permeability, seasonal wetness, and limited depth to bedrock are the major limitations for some nonfarm uses. Capability unit IIIe-4; woodland suitability group 3o1.

EuB—Ellsworth-Urban land complex, undulating. This mapping unit consists of 20 to 60 percent undisturbed Ellsworth soil in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent borrow or fill areas; and 15 to 30 percent areas covered by buildings, driveways, and streets. Slopes range from 2 to 6 percent. Most areas are used for residential or industrial development, and much of the Ellsworth soil has been altered or covered as a result of grading and digging.

In fill areas, 1 to 3 feet of material covers the undisturbed Ellsworth soil or the included areas of Mahoning soil. The fill material consists of Ellsworth subsoil and substratum material. In the borrow areas, silty clay and silty clay loam subsoil and substratum are exposed.

The surface layer in disturbed areas commonly has low organic matter content and poor physical characteristics. It is soft and sticky when wet, and it cracks and is hard when dry. The mapping unit is not suitable for lawns and landscaping unless topsoil is applied.

Runoff is rapid, and the hazard of erosion is severe if the soil is left bare during construction. Both gullying and sedimentation are common during these periods. Slow permeability and the poor physical condition of the surface layer are the major limitations for many nonfarm uses. Not assigned to a capability unit; not assigned to a woodland suitability group.

Fitchville Series

The Fitchville series consists of deep, nearly level to gently sloping, somewhat poorly drained soils that formed in silty, water-deposited sediment. These soils are on stream terraces and glacial lakebeds throughout the county.

In a representative profile the surface layer is dark grayish brown silt loam 7 inches thick. The subsoil extends to a depth of 39 inches; it is mottled yellowish brown and strong brown silt loam and silty clay loam. The substratum to a depth of 60 inches is mottled yellowish brown silty clay loam.

Fitchville soils have a moderately deep root zone and a moderate to high available water capacity. Permeability is slow. These soils have a water table near the surface late in winter and spring. Crops respond well to artificial drainage on these soils. Fitchville soils are soft and compressible when wet and have low stability.

Some areas of Fitchville soils are cultivated. The areas that are cultivated are used for corn, wheat, and grass-legume meadow. Many areas that were previously farmed are now idle or used as pasture. Some areas are wooded.

Representative profile of Fitchville silt loam, 0 to 2 percent slopes, in Hiram Township, 2,600 feet north of Hankee Road, 150 feet east of State Route 700:

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam with a few zones of yellowish brown (10YR 5/4); weak coarse granular structure; friable; strongly acid; abrupt smooth boundary.

B&A—7 to 11 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct light brownish gray blocky structure; firm; thick continous light brown-(2.5Y 6/2) mottles; moderate coarse subangular brownish gray (2.5Y 6/2) silt coatings on ped faces; very strongly acid; clear smooth boundary.

B21t—11 to 21 inches; strong brown (7.5YR 5/6) silty clay loam; many medium distinct gray (5Y 6/1) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; thin continuous light brownish gray (2.5Y 6/2) silt coatings on ped faces; thin patchy clay films on ped faces; very strongly acid; clear smooth boundary.

B22t—21 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct gray (5Y 6/1) mottles; moderate coarse prismatic structure; firm; thin continuous gray (5Y 6/1) silt coatings on ped faces; thin patchy clay films mainly on vertical ped faces and in pores in ped interiors; medium acid; clear smooth boundary.

B3—34 to 39 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct gray (5Y 6/1) mottles; weak coarse prismatic structure; firm; thin continuous light brownish gray (2.5Y 6/2) silt coatings on ped faces; thin patchy clay films on vertical ped faces; neutral; clear wavy boundary.

C—39 to 60 inches; yellowish brown (10YR 5/4) light silty clay loam; many medium and coarse distinct gray (5Y 5/1) and common medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; a few lime concretions and segregations; mildly alkaline; calcareous.

The solum is 30 to 42 inches thick. Reaction is very strongly acid to strongly acid in the upper part of the B horizon and medium acid to neutral in the lower part. The C horizon is slightly acid to mildly alkaline.

In uncultivated areas there is a very dark gray (10YR 3/1) A1 horizon 2 to 4 inches thick and a light brownish gray (2.5Y 6/2) A2 horizon 3 to 4 inches thick. Color of the Ap horizon is dark grayish brown (10YR 4/2) or (2.5Y 4/2). Matrix colors in the B horizon have a hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5, and chroma of 4 through 6. Ped faces dominantly have a chroma of 2 or less. The B horizon is silt loam to silty clay loam.

Fitchville soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained Glenford soils, the poorly drained Sebring soils, and the very poorly drained Sebring variant. They are commonly adjacent to these soils and to Canadice, Caneadea, Jimtown, Mahoning, Ravenna, Remsen, and Wadsworth soils. Fitchville soils have a less clayey B horizon than Canadice, Caneadea, Mahoning, and Remsen soils, and they also contain more silt than Mahoning soils. They have more silt and less sand than Jimtown soils. They lack the fragipan characteristic of Ravenna and Wadsworth soils.

FcA—Fitchville silt loam, 0 to 2 percent slopes. This is a nearly level soil in broad areas in valleys and in partly blocked drainageways on uplands. It has the

profile described as representative of the series. This soil is very susceptible to surface crusting.

Included in mapping are small areas of the poorly drained Sebring soils in depressions and swales. Small areas of the somewhat poorly drained Jimtown soils, which are commonly next to this Fitchville soil, are also included in mapping.

Runoff is slow, and water ponds in some areas during periods of heavy rainfall. There is a moderate hazard of wetness if the soil is cultivated. Seasonal wetness, low stability, and moderately slow permeability are the major limitations to many nonfarm uses of this soil. Capability unit IIw–4; woodland suitability group 2w3.

FcB—Fitchville silt loam, 2 to 6 percent slopes. This is a gently sloping soil on rises on broad, nearly level terraces and in drainageways.

Included in mapping are small areas of moderately well drained Glenford soils. Also included in low spots in drainageways are small areas of the poorly drained Sebring soils.

Runoff is medium to rapid, and the hazard of erosion is moderate. Seasonal wetness is the major limitation to use of this soil for cultivated crops. Seasonal wetness, low stability, and moderately slow permeability are the major limitations to nonfarm uses. Capability unit IIw–4; woodland suitability group 2w3.

FnA—Fitchville-Urban land complex, nearly level. This mapping unit consists of 20 to 60 percent undisturbed Fitchville soils in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent fill and some areas of borrow material; and 15 to 30 percent areas covered by buildings, driveways, and streets. Most of this soil is used for urban or industrial development, and much of the soil has been altered or covered as a result of grading and digging.

Included in mapping are areas of Sebring soils and areas of soils that have slopes of as much as 6 percent.

In fill areas, 1 to 3 feet of fill material covers the Fitchville soil. The fill material consists of silty subsoil and substratum material from other areas. In borrow areas, material from the subsoil and substratum are exposed.

The surface layer in disturbed areas commonly has a low organic matter content and poor physical characteristics. It has a narrow range of moisture content suitable for optimum tillage. The surface layer tends to crust and seal over after periods of rainfall.

Seasonal wetness is a limitation, particularly where grading has resulted in depressions or bowl-shaped areas. Disturbed areas in this mapping unit are highly susceptible to erosion. The materials in this mapping unit have low stability when wet. Not assigned to a capability unit; not assigned to a woodland suitability group.

Frenchtown Series

The Frenchtown series consists of deep, nearly level, poorly drained soils that formed in loam glacial till. These soils occupy low landscape positions.

In a representative profile the surface layer is grayish brown silt loam 7 inches thick. The subsoil extends to a depth of 66 inches. To a depth of 12 inches it is firm mottled, light brownish gray silt loam, and from a depth of 12 to 30 inches it is firm, mottled, light brownish gray and gray silty clay loam. To a depth of 48 inches, it is a compact dark yellowish brown clay loam and dark brown gravelly loam fragipan. The lower part of the subsoil is dark brown gravelly loam and yellowish brown clay loam. The substratum to a depth of 80 inches is yellowish brown loam glacial till.

Frenchtown soils have a moderately deep root zone when the water table is low in summer. The available water capacity is moderate, and permeability is slow. The water table is within 4 feet of the surface most of the year; it is near the surface in spring. The soils are slow to dry out in the spring unless they are artificially drained.

Most areas of Frenchtown soils are wooded, but a few areas have been cleared.

Representative profile of Frenchtown silt loam, in Nelson Township, 2½ miles north northwest of Nelson, 4,000 feet south of Geauga County line, 1,000 feet west of intersection of Pritchard and Prentiss Roads:

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam; moderate medium and coarse granular structure; friable; few fine black (10YR 2/1) concretions; very strongly acid; abrupt smooth boundary.

B1g—7 to 12 inches; light brownish gray (2.5Y 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6–5/8) mottles; moderate medium subangular blocky structure; firm; common medium black (10YR 2/1) concretions; 1 to 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B21g—12 to 21 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6–5/8) mottles; moderate medium subangular blocky structure; firm; thin continuous light brownish gray (2.5Y 6/2) silt coatings on ped faces; thin very patchy clay films on pores and voids in ped interiors; 2 percent coarse fragments; very strongly acid; clear wavy boundary.

B22gt—21 to 30 inches; gray (5Y 5/1) silty clay loam; many medium prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous gray (5Y 6/1) silt coatings on ped faces; thin patchy clay films on ped faces; few medium black (10YR 2/1) concretions; 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx1—30 to 41 inches; dark yellowish brown (10YR 4/4) clay loam; weak very coarse prismatic structure parting to weak thick platy; polygons are 4 to 5 inches across; very firm, about 60 percent brittle; thin continuous gray (5Y 6/1) silt coatings on ped faces; vertical gray (5Y 6/1) seams 5 to 12 millimeters thick; medium continuous clay films on vertical ped faces; thin patchy clay films on some horizontal surfaces; common very dark brown (10YR 2/2) stains in ped interiors; about 5 percent coarse fragments; strongly acid; clear smooth boundary.

IIBx2—41 to 48 inches; dark brown (10YR 4/3) gravelly loam; weak very coarse prismatic structure; very firm, about 60 percent brittle; thin continuous gray (5Y 6/1) silt coatings on vertical ped faces; medium patchy clay films on vertical ped faces; thin very patchy clay films on some horizontal surfaces; about 5 percent coarse fragments; strongly acid; gradual smooth boundary.

IIB31—48 to 57 inches; dark brown (10YR 4/3) heavy gravelly loam; weak very coarse prismatic structure; firm; a few gray (5Y 6/1) vertical seams; about 10 percent coarse fragments; very strongly acid; clear smooth boundary.

IIB32—57 to 66 inches; yellowish brown (10YR 5/4) clay loam; weak very coarse prismatic structure; firm; a few gray (5Y 6/1) vertical seams; about 10

percent coarse fragments; medium acid; clear smooth boundary.

IIIC—66 to 80 inches; yellowish brown (10YR 5/4) loam; massive; firm; 10 to 15 percent coarse fragments; medium acid.

The solum is 50 to 70 inches thick. Reaction in and above the fragipan is strongly acid or very strongly acid except where the soil has been limed. The lower part of the B horizon is very strongly acid to medium acid. The C horizon is medium acid to moderately alkaline.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). In uncultivated areas, the A1 horizon is black (10YR 2/1) or very dark gray (10YR 3/1) and is 3 to 5 inches thick. It is underlain by an A2 horizon 4 to 6 inches thick. The horizons above the fragipan have hue of 10YR through 5Y, value of 4 through 6, and chroma of 2 or less. They are clay loam, silty clay loam, loam, or silt loam. Dominant colors of the ped interiors of the Bx horizon have a hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. The fragipan is loam, clay loam, or gravelly loam.

Frenchtown soils are the poorly drained member of a drainage sequence that includes the well drained Wooster soils, the moderately well drained Canfield and Rittman soils, and the somewhat poorly drained Ravenna and Wadsworth soils. They are commonly adjacent to these soils and to the poorly drained Sebring soils that are on the same landscape position. Frenchtown soils differ from Sebring soils in having a fragipan and in having formed in glacial till.

Fr—Frenchtown silt loam. This is a nearly level soil on the undulating till plain and in long, narrow areas along drainageways. Included in mapping are small areas of the silty Sebring soils and small areas of Holly soils adjacent to small streams flowing through this soil.

Runoff from surrounding higher soils tends to accumulate on this soil. The hazard of wetness is severe if this soil is cultivated. Excessive wetness and slow permeability are the major limitations to most nonfarm uses of this soil. Capability unit IIIw-6; woodland suitability group 2w2.

Geeburg Series

The Geeburg series consists of deep, moderately well drained, gently sloping to very steep soils that formed in silty clay glacial till. These soils are in the south-central and southeastern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 30 inches; it is dark yellowish brown clay. The substratum to a depth of 60 inches is yellowish brown and brown clay and silty clay.

Geeburg soils have a moderately deep root zone and a moderate available water capacity. Permeability is very slow in the subsoil and substratum. The soils have a high shrink-swell potential.

Most areas have been cleared of trees and were once farmed but are now idle. Some areas are in woodland or pasture. Other areas, near Ravenna, are used for community development.

Representative profile of Geeburg silt loam, 2 to 6 percent slopes, in Paris Township, 2½ miles north and 1¼ miles west of Palmyra, 250 feet north of Cable Line Road (Profile PG-S12 in the section "Laboratory Data"):

Ap—0 to 7 inches; grayish brown (10YR 4/2) silt loam; weak coarse granular and weak fine subangular blocky structure; strongly acid; abrupt smooth boundary.

A&B—7 to 9 inches; equal mixture of A2 horizon material and chunks from the upper part of the B horizon; the A2 horizon material is light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/4) friable silt loam; the chunks of B horizon material are yellowish brown (10YR 5/6) firm silty clay that has thin clay films in pores; weak fine and medium subangular blocky structure; very strongly acid; clear smooth boundary.

B21t—9 to 12 inches, dark yellowish brown (10YR 4/4) clay; few fine distinct grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; weak fine and medium prismatic structure parting to weak fine and medium angular blocky; very firm; few roots, mostly on ped faces; thin continuous grayish brown (2.5Y 5/2) clay films on prism faces; thin patchy brown (10YR 4/3) clay films on peds inside prisms; 1 percent coarse fragments; very strongly acid; gradual smooth boundary.

B22t—12 to 20 inches; dark yellowish brown (10YR 4/4) clay; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak medium and coarse angular blocky; very firm; few roots, mainly on ped faces; grayish brown (10YR 5/2) clay films on prism faces and patchy brown (10YR 4/3) clay films on horizontal ped faces; 1 percent coarse fragments; strongly acid; gradual wavy boundary.

B23t—20 to 30 inches; dark yellowish brown (10YR 4/4) clay; common coarse distinct gray (10YR 5/1) mottles; moderate medium and coarse prismatic structure parting to moderate coarse angular blocky; very firm; few roots on prism faces; thin continuous grayish brown (10YR 5/2) clay films on vertical prism faces; common pale yellow (2.5Y 7/4) and white (2.5Y 8/2) calcareous splotches on vertical prism faces in the lower 2 inches; thin continuous brown (10YR 4/3) clay films on faces of peds inside prisms; few fine black stains on horizontal interior faces; 1 percent coarse fragments; neutral grading to moderately alkaline in lower part; gradual smooth boundary.

C1—30 to 38 inches; dark yellowish brown (10YR 4/4) clay; coarse distinct gray (N 5/0) mottles; weak coarse prismatic structure parting to weak medium and coarse angular blocky; very firm; few roots; thin grayish brown (10YR 5/2) clay films on prism faces; large pale yellow (2.5Y 7/4) and white (2.5Y 8/2) calcareous splotches are common in prism interiors; 1 percent coarse fragments; moderately alkaline, calcareous; diffuse wavy boundary.

C2—38 to 60 inches; brown (10YR 5/3) silty clay; weak very coarse prismatic structure; very firm; thin patchy olive gray (5Y 4/2, 5/1) clay films on prism faces; common white (2.5Y 8/2) and pale yellow (2.5Y 8/4) calcareous splotches; few fine black stains on faces of peds; 1 percent coarse fragments; moderately alkaline, calcareous.

The solum is 20 to 40 inches thick. The A horizon and the upper part of the B horizon are very strongly acid or strongly acid in unlimed areas. The lower part of the B horizon ranges from slightly acid to moderately alkaline. Content of coarse fragments ranges from 1 to 5 percent.

In undisturbed areas, the A1 horizon is very dark grayish brown (10YR 3/2) or black (10YR 2/1) and is 1 to 4 inches thick, and the A2 horizon is brown and is 2 to 8 inches thick. The B2t horizon ranges from brown (10YR 4/3) to dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4). It is silty clay or clay. The C horizon is silty clay and clay.

Geeburg soils are the moderately well drained member of a drainage sequence that includes the poorly drained Trumbull soils and the somewhat poorly drained Remsen soils. Geeburg soils are commonly adjacent to Ellsworth and Glenford soils. They have more clay in the B horizon than Ellsworth and Glenford soils.

GbB—Geeburg silt loam, 2 to 6 percent slopes. This

is a gently sloping soil on the top and on side slopes of rises on broad, undulating till plains. It has the profile described as representative of the series.

Included in mapping are small areas of the somewhat poorly drained Remsen soils.

Runoff is medium, and the hazard of erosion is severe if this soil is cultivated. Very slow permeability, seasonal wetness, and a high shrink-swell potential are the major limitations of this soil for many nonfarm uses. Capability unit IIIe-4; woodland suitability group 2c1.

GbB2—Geeburg silt loam, 2 to 6 percent slopes, moderately eroded. This is a gently sloping soil on rises on broad, undulating till plains. It has a profile similar to the one described as representative of the series, except that the surface layer and the subsoil are thinner as the result of erosion, and the present surface layer includes some clayey material from the upper part of the subsoil. The surface layer has a very low content of organic matter and is very susceptible to crusting.

Runoff is medium, and the hazard of erosion is severe if this soil is cultivated. Very slow permeability, seasonal wetness, and a high shrink-swell potential are the major limitations of this soil for many nonfarm uses. Capability unit IIIe-4; woodland suitability group 2c1.

GbC2—Geeburg silt loam, 6 to 12 percent slopes, moderately eroded. This is a sloping soil along small drainageways and at the head of large drainageways. In most areas, as much as 6 inches of the original surface layer has been lost through erosion. The present surface layer consists of the remaining original surface layer and some clayey subsoil material.

Included in mapping are small areas of the somewhat poorly drained Remsen soils and a few areas of uneroded soils.

Runoff is rapid, and the hazard of erosion is very severe if this soil is cultivated. Very slow permeability, slope, a high shrink-swell potential, and poor stability are limitations of this soil for many nonfarm uses. Capability unit IVe-1; woodland suitability group 2c1.

GbD2—Geeburg silt loam, 12 to 18 percent slopes, moderately eroded. This is a moderately steep soil on hillsides along drainageways. Most areas are long and less than 10 acres in size.

Most areas have been cultivated, and erosion has removed much of the original surface layer. The present surface layer consists of the remaining original surface layer and some subsoil material. Parts of some areas are wooded, and these are not eroded.

Runoff is very rapid, and the hazard of erosion is very severe, unless a plant cover is maintained. Because of the erosion hazard and droughtiness, this soil is best suited to hay and pasture. Very slow permeability, slope, rapid runoff, a high shrink-swell potential, and poor stability are limitations of this soil for many nonfarm uses. Capability unit VIe-1; woodland suitability group 2c2.

GcB—Geeburg-Urban land complex, undulating. This mapping unit consists of 20 to 60 percent undisturbed Geeburg soil in undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent borrow or fill areas; and 15 to 30 percent areas that are covered by buildings, driveways, and streets. Slopes range from 2 to 12 percent. Most areas are used for residential or industrial development, and much of the soil has been altered or covered as a result of grading and digging.

In fill areas, 1 to 3 feet of material covers the Geeburg soil. The fill material consists of Geeburg subsoil and substratum material from other areas. Fill areas are not suitable for lawns and landscaping unless topsoil is added.

In borrow areas, silty clay material from the subsoil and substratum are exposed. The surface layer in disturbed areas commonly has low organic-matter content and very poor tilth. It is soft and sticky when wet, and it cracks and is hard when dry.

Runoff from disturbed areas is rapid, and gullies form quickly. The hazard of erosion is severe if the soil is left bare during construction. Very slow permeability, slope, and a high shrink-swell potential are limitations of these soils for many nonfarm uses. Not assigned to a capability unit; not assigned to a woodland suitability group.

GEF—Geeburg and Glenford silt loams, steep. These are steep to very steep soils on valley walls and terrace breaks along drainageways. Slopes are irregular and are broken in many places by intermittent drainageways. The slope range is mainly 35 to 50 percent, but in some areas it is 18 to 35 percent. Most areas are wooded.

These soils have profiles similar to the ones described as representative of their respective series. The Geeburg soil is dominant in some areas and the Glenford soil in others. The soils occur in no regular pattern. In some areas, slips have obliterated the natural soil profile.

Included with these soils in mapping are some areas of Chili soils and soils in an area, along the Mahoning River north of State Route 5 in Ravenna Township, where the Mahoning River has cut through layers of clayey glacial till and gravelly outwash.

Runoff is very rapid on these soils. Slope and the hazard of slippage are the main limitations for most nonfarm uses. Capability unit VIIe-1; woodland suitability group 2c3.

Glenford Series

The Glenford series consists of deep, moderately well drained, nearly level to very steep soils that formed in stratified silty material. These soils are on terraces throughout the county.

In a representative profile the surface layer is dark grayish brown silt loam 7 inches thick. The subsoil, which extends to a depth of 42 inches, is mottled, yellowish brown and dark yellowish brown silt loam and silty clay loam. The substratum to a depth of 60 inches is mottled yellowish brown silt loam.

Glenford soils have a deep root zone and a high available water capacity. Permeability is moderately slow in the subsoil and substratum. These soils are saturated to within 2 feet of the surface during periods of high rainfall in winter and spring. They are soft and compressible when saturated. They are unstable on slopes.

A few areas of Glenford soils are used for such cultivated crops as corn and wheat. Other areas are

used as pasture or for hay crops. However, most areas formerly cleared for farming are reverting to brush and trees.

Representative profile of Glenford silt loam, 2 to 6 percent slopes, in Brimfield Township, ½ mile south of Kent, 250 feet west of Sunnybrook Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable; many roots; medium acid; abrupt smooth boundary.

B1—7 to 10 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common roots; very strongly acid; clear wavy boundary.

B21t—10 to 17 inches; yellowish brown (10YR 5/4) light silty clay loam; common fine faint light yellowish brown (2.5Y 6/4) mottles; moderate medium subangular blocky structure; firm; few roots; thin patchy dark yellowish brown (10YR 4/4) clay films in voids and on faces of peds; strongly acid; clear wavy boundary.

B22t—17 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles with yellowish brown (10YR 5/6) rinds; moderate medium prismatic structure parting to weak thick platy; firm; few roots; thin patchy clay films in voids and on faces of peds; strongly acid; clear wavy boundary.

B3—30 to 42 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (2.5Y 6/2) mottles with brownish yellow (10YR 6/6) and yellowish red (5YR 4/6) rinds and stains; weak coarse prismatic structure parting to weak thin platy; friable; few roots; few clay-enriched areas in the upper part of horizon; medium acid; clear wavy boundary.

C—42 to 60 inches; yellowish brown (10YR 5/4) silt loam; common fine and medium distinct light brownish gray (2.5Y 6/2) mottles with brownish yellow (10YR 6/6) rinds; weak thick platy structure; friable; few lenses of very fine sand; slightly acid.

The solum is 30 to 60 inches thick. It is very strongly acid to medium acid in the upper part and medium acid to slightly acid in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). Where present, the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) and is 1 to 4 inches thick. The A2 horizon is brown (10YR 5/3) through light yellowish brown (10YR 6/4) and is 2 to 8 inches thick. The B1 horizon has a hue of 10YR, value of 4 or 5, and chroma of 3 through 6. The B2t horizon has a hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Mottles that have a chroma of 2 or less are within 10 inches of the top of the B2t horizon. The B2t horizon ranges from silt loam to silty clay loam. The C horizon is dominantly stratified silt loam and silty clay loam but includes thin strata of loam, fine sandy loam, very fine sand, or light silty clay.

Glenford soils are the moderately well drained member of a drainage sequence that includes the somewhat poorly drained Fitchville soils, the poorly drained Sebring soils, and the very poorly drained Sebring variant. They are often adjacent to these soils and to Bogart, Geeburg, Ellsworth, and Rittman soils. The Glenford soils have a less clayey B horizon than Ellsworth and Geeburg soils. Glenford soils are less sandy than Bogart soils and are gravel free. They have more silt but less sand and coarse fragments than Rittman soils. They also lack the fragipan characteristic of Rittman soils.

GfA—Glenford silt loam, 0 to 2 percent slopes. This is a nearly level soil on terraces, and areas are variable in size. In some places thin seams of gravelly material 2 to 6 inches thick are below a depth of 30 inches.

Included in mapping are a few small areas of the somewhat poorly drained Fitchville soils in depressions and in small drainageways. Also included are a few areas that are more acid in the lower part of the subsoil than most Glenford soils.

Runoff is slow. The surface layer is susceptible to crusting, but otherwise this soil has few limitations to farming. Moderately slow permeability and poor stability when wet are the major limitations to some nonfarm uses. Capability unit I–1; woodland suitability group 1o1.

GfB—Glenford silt loam, 2 to 6 percent slopes. This is a gently sloping soil on terraces throughout the county. It has the profile described as representative of the series. Some areas of this soil are elongated, but most areas are 2 to 10 acres in size.

Included in mapping are small areas of the somewhat poorly drained Fitchville soils, particularly in less sloping areas where water from surrounding slopes accumulates. Also included are a few areas that are more acid in the lower part of the subsoil than most Glenford soils.

Runoff is medium to rapid, and the hazard of erosion is moderate if this soil is cultivated. Moderately slow permeability and poor stability when wet are the major limitations to some nonfarm uses of this soil. Capability unit IIe–1; woodland suitability group 1o1.

GfC2—Glenford silt loam, 6 to 12 percent slopes, moderately eroded. This is a sloping soil mainly along drainageways. Most areas are elongated and are 5 to 10 acres in size. Most areas of this soil have lost as much as 50 percent of the original surface layer through erosion. The present surface layer consists of a mixture of the original surface layer and yellowish brown subsoil material. The surface layer has a lower organic matter content than uneroded areas, and it is subject to crusting.

Included in mapping are a few uneroded areas, small areas of Ellsworth and Rittman soils, and a few areas that are more acid in the lower part of the subsoil than most Glenford soils.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. Moderately slow permeability, poor stability, and slope are the major limitations to many nonfarm uses of this soil. Capability unit IIIe–1; woodland suitability group 1o1.

GfD2—Glenford silt loam, 12 to 18 percent slopes, moderately eroded. This is a moderately steep soil on hillsides, mainly along drainageways. Much of the original surface layer has been lost through erosion. Erosion has lowered the organic matter content of the surface layer, and, as a result, it is subject to crusting.

Included in mapping are a few areas that are more acid in the lower part of the subsoil than most Glenford soils, and a few uneroded areas.

Runoff is rapid, and the hazard of erosion is very severe if this soil is cultivated. Slope, poor stability, and moderately slow permeability are limitations to most nonfarm uses of this soil. Capability unit IVe–2; woodland suitability group 1r1.

Haskins Series

The Haskins series consists of deep, gently sloping, somewhat poorly drained soils. These soils formed in loamy material 24 to 40 inches thick and in the underlying finer textured calcareous till or lacustrine material.

In a representative profile the surface layer is dark grayish brown loam 8 inches thick. The subsoil extends to a depth of 44 inches. To a depth of 13 inches it is friable, yellowish brown sandy loam; to a depth of 28 inches it is firm, mottled yellowish brown clay loam; and to a depth of 44 inches it is firm, olive brown silty clay. The substratum to a depth of 60 inches is olive brown silty clay. The surfaces of natural aggregates in the subsoil have grayish coatings.

Haskins soils have a moderately deep root zone and a moderate available water capacity. Permeability is moderate in the upper part of the profile and slow in the substratum. The water table is near the surface late in winter and in spring.

Although many areas are now idle, most Haskins soils have been cultivated. The major crops include corn, wheat, and grass-legume meadow. Crops respond well to artificial drainage.

Representative profile of Haskins loam, in Ravenna Township, 1¾ miles west of Ravenna, 1,280 feet west of the intersection of Redbush and Brady Lake Roads, 170 feet south of Brady Lake Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam; weak fine and medium granular structure; friable; neutral; abrupt smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; grayish brown (10YR 5/2) ped coatings; dark grayish brown (10YR 4/2) fillings in root channels; neutral; clear wavy boundary.

B21tg—13 to 19 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct olive (5Y 5/3) mottles; moderate coarse subangular blocky structure; firm; light brownish gray (10YR 6/2) ped coatings; about 5 percent coarse fragments; thin patchy clay films on ped surfaces; slightly acid; clear wavy boundary.

B22tg—19 to 28 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; light brownish gray (2.5Y 6/2) ped coatings; thin patchy clay films on ped faces; about 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.

IIB31—28 to 34 inches; olive brown (2.5Y 4/4) silty clay; moderate medium and coarse angular blocky structure; firm; light brownish gray (2.5Y 6/2) ped coatings; thin very patchy clay films on a few ped faces; few medium black (10YR 2/1) stains on ped interiors; about 1 percent coarse fragments strongly acid; gradual wavy boundary.

IIB32—34 to 44 inches; olive brown (2.5Y 4/4) silty clay; moderate brownish gray (2.5Y 6/2) ped coatings; about 1 percent coarse fragments; slightly acid; gradual wavy boundary.

IIC—44 to 60 inches; olive brown (2.4Y 4/4) silty clay; moderate thick platy structure; firm; about 3 percent coarse fragments; mildly alkaline.

The solum is 32 to 48 inches thick. The B horizon is very strongly acid to neutral.

The Ap horizon is dark grayish brown (10YR 4/2) to dark gray (10YR 4/1). The matrix color of the B horizon has a hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. The upper part of the B horizon is dominantly loam, clay loam, or sandy clay loam, but includes thin layers of sandy loam. The IIB and IIC horizons are heavy silty clay loam, silty clay, and clay.

HaB—Haskins loam, 2 to 6 percent slopes. This is a gently sloping soil that is in irregular areas, generally less than 10 acres in size.

Included in mapping are small areas of the somewhat poorly drained Jimtown soils that are underlain by sand and gravel rather than by clayey material. Some areas of the more clayey Remsen soils are also included.

Runoff is slow to medium, and the hazards of erosion and wetness are moderate if this soil is cultivated. Seasonal wetness is the major limitation to many nonfarm uses of this soil. Capability unit IIw–4; woodland suitability group 2w3.

Holly Series

The Holly series consists of deep, nearly level, poorly drained soils on flood plains throughout the county. These soils formed in recent alluvium.

In a representative profile the surface layer is dark grayish brown silt loam 5 inches thick. The subsoil, which extends to a depth of 25 inches, is mottled and friable dark gray, grayish brown, and gray silt loam. The substratum to a depth of 60 inches is mottled or stratified grayish brown and gray loam and silt loam.

Holly soils have a deep root zone when the water table is low in summer or if the soil is drained, and they have a high available water capacity. Holly soils have a high water table in winter, spring, and early in summer, and they are subject to flooding. Permeability is moderate to moderately slow.

Most areas of these soils are either in woodland or pasture.

Representative profile of Holly silt loam, in Mantua Township, 1,100 feet south of State Route 82, 800 feet east of Chamberlain Road, and 500 feet north of railroad tracks:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; moderate coarse granular structure; friable; slightly acid; clear wavy boundary.

B1g—5 to 11 inches; dark gray (5Y 4/1) silt loam; common medium prominent brown (7.5YR 4/4) and dark reddish brown (2.5YR 3/4) mottles; moderate fine subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21g—11 to 17 inches; grayish brown (2.5Y 5/2) silt loam; many medium prominent reddish brown (5YR 4/4) mottles; weak medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

B22g—17 to 25 inches; gray (10YR 5/1) silt loam; many medium and coarse brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; grayish brown (2.5Y 5/2) coatings on vertical ped faces; slightly acid; gradual smooth boundary.

C1—25 to 34 inches; grayish brown (2.5Y 5/2) loam; common medium prominent reddish brown (5YR 4/4) mottles; massive; firm; slightly acid; gradual smooth boundary.

C2—34 to 48 inches; gray (5Y 5/1) loam; many large distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; neutral; clear smooth boundary.

C3—48 to 60 inches, gray (5Y 5/1) stratified loam and silt loam; massive; friable; common zones of organic matter; neutral.

The solum is medium acid to neutral. It is mainly silt loam, sandy loam, or loam.

The A horizon has a hue of 10YR, value of 4, and chroma of 1 or 2. The colors of the B and C horizons include gray (10YR 5/1, N5/0, 5Y 5/1, 5Y 6/1), grayish brown (10YR 5/2, 2.5Y 5/2), or dark gray (10YR 4/1, 5Y 4/1).

Holly soils are the poorly drained member of a drainage sequence that includes the well drained Tioga soils and the

somewhat poorly drained Orrville soils. They are commonly adjacent to these soils on flood plains. Holly soils have grayer colors in the B horizon than Orrville or Tioga soils.

Ho—Holly silt loam. This is a nearly level soil mostly on narrow flood plains and strips on large flood plains. Areas of this soil are generally less than 50 acres in size.

Included in mapping are small areas of the somewhat poorly drained Orrville soils and a few areas where the surface layer is dark gray and is as much as 6 inches thick.

Runoff is slow to ponded. Because this soil is in low areas along streams, it is subject to flooding. The hazard of wetness is severe if this soil is cultivated. The hazard of flooding is the major limitation to most nonfarm uses of this soil. Capability unit IIIw-1; woodland suitability group 2w2.

Hornell Series

The Hornell series consists of moderately deep, somewhat poorly drained to moderately well drained, gently sloping soils that formed partly in glacial till and partly in residuum from the underlying shale bedrock. These soils are on uplands mainly within the Ravenna Arsenal. Shale bedrock is at a depth of 30 to 40 inches.

In a representative profile the surface layer is dark grayish brown silt loam about 8 inches thick. The upper part of the subsoil, between depths of 8 and 21 inches, is mottled and firm yellowish brown silty clay loam and silty clay. The lower part of the subsoil, between depths of 21 and 31 inches, is firm mottled dark brown silty clay that contains shale fragments. Soft, partly weathered shale extends to a depth of 40 inches. Unweathered soft thin-bedded shale bedrock is at a depth of 40 inches.

Hornell soils have a moderately deep root zone and a low available water capacity. Permeability is very slow. These soils are seasonally saturated with water, and the underlying shale limits root penetration.

Hornell soils in the county are cleared of trees, but are mostly no longer cultivated. These soils are not extensive.

Representative profile of Hornell silt loam, 3 to 8 percent slopes, in Windham Township, 2.1 miles south of Windham, 700 feet east of Paris-Windham Road, and 800 feet north of Remalia Road in Ravenna Arsenal:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; about 1 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B21—8 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse subangular blocky structure; firm; light brownish gray (2.5Y 6/2) ped coatings; thin very patchy clay films lining pores; about 1 percent coarse fragments; very strongly acid; clear smooth boundary.

B22—14 to 21 inches; yellowish brown (10YR 5/4) silty clay; many medium distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse prismatic structure; firm; gray (5Y 5/1) ped coatings; thin very patchy clay films lining pores; about 1 percent gray coarse fragments; very strongly acid; clear smooth boundary.

IIB3—21 to 31 inches; dark brown (7.5YR 4/4) silty clay; many medium distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak thick platy; firm; gray (5Y 5/1) ped coatings; common zones of partly weathered shale; very strongly acid; clear smooth boundary.

IIC1—31 to 40 inches; dark grayish brown (10YR 4/2) and grayish brown (2.5Y 5/2) partly weathered shale; some vertical zones of gray (5Y 5/1); very strongly acid; gradual smooth boundary.

IIR—40 to 60 inches; dark grayish brown (10YR 4/2) thin-bedded soft shale.

Depth to shale bedrock is 24 to 40 inches. Reaction is strongly acid to very strongly acid throughout except where the soil has been limed.

The Ap horizon is typically dark grayish brown (10YR 4/2, 2.5Y 4/2). The B horizon is yellowish brown (10YR 5/4) to dark brown (7.5YR 4/4) heavy silty clay loam or silty clay. The C horizon is dark grayish brown (10YR 4/2) to grayish brown (2.5Y 5/2).

Hornell soils are on landscapes similar to Loudonville and Mitiwanga soils. They are underlain by shale, whereas Loudonville and Mitiwanga soils are underlain by sandstone bedrock.

HrB—Hornell silt loam, 3 to 8 percent slopes. This is a gently sloping soil on uplands, mainly in the Ravenna Arsenal. Most areas of this soil are less than 10 acres in size, but one area is about 50 acres in size.

Included in mapping are small areas of Ellsworth and Mahoning soils that have bedrock at a depth of more than 40 inches.

Runoff is medium, and the hazard of erosion is severe if this soil is cultivated. Very slow permeability, seasonal wetness, and moderate depth to shale bedrock are the major limitations of this soil for many nonfarm uses. Capability unit IIIw-4; woodland suitability group 3w1.

Jimtown Series

The Jimtown series consists of deep, somewhat poorly drained, nearly level to gently sloping soils that formed in loamy material overlying sand and gravel. These soils are on outwash terraces throughout the county.

In a representative profile the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is mottled and extends to a depth of 36 inches. It is grayish brown loam to a depth of 11 inches, yellowish brown sandy loam to 17 inches, light brownish gray clay loam to 26 inches, brown gravelly sandy loam to 36 inches. The substratum to a depth of 60 inches is light brownish gray and dark gray loamy sand and sand.

Jimtown soils have a moderately deep to deep root zone and a moderate available water capacity. Permeability is moderate in the subsoil and rapid in the underlying sand and gravel. The water table is near the surface late in winter and in spring.

Most areas of Jimtown soils are not cultivated. Where this soil is cultivated, the main crops are corn, wheat, and grass-legume hay. Crops respond well to artificial drainage.

Representative profile of Jimtown loam, 0 to 2 percent slopes, in Ravenna Township, 3 miles northwest of Ravenna, 200 feet west of State Route 14, and 600 feet north of Dawley Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable; 3 per-

cent gravel; very strongly acid; abrupt smooth boundary.

B1—7 to 11 inches; grayish brown (2.5Y 5/2) loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; thin patchy dark grayish brown (2.5Y 4/2) coatings on ped faces; 4 percent gravel; very strongly acid; clear smooth boundary.

B21t—11 to 17 inches; yellowish brown (10YR 5/4) heavy sandy loam; many coarse distinct light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure; firm; brownish gray (2.5Y 6/2) coating on ped faces; thin clay films bridging sand grains; 10 percent gravel; very strongly acid; clear wavy boundary.

B22t—17 to 26 inches; light brownish gray (2.5Y 6/2) light clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; medium continuous clay films bridging sand grains; 5 percent gravel, strongly acid; clear wavy boundary.

B3—26 to 36 inches; brown (10YR 4/3) gravelly sandy loam; common medinm distinct yellowish brown (10YR 5/6) and gray (5Y 5/1) mottles; massive; friable; thin very patchy clay films bridging sand grains; 15 percent gravel; slightly acid; clear wavy boundary.

C1—36 to 47 inches; light brownish gray (2.5Y 6/2) loamy sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grained; loose; 2 percent gravel; slightly acid; clear smooth boundary.

C2—47 to 55 inches; light brownish gray (2.5Y 6/2) sand; single grained; loose; slightly acid; clear smooth boundary.

C3—55 to 60 inches; dark gray (5Y 4/1) fine sand; single grained; loosc; neutral.

The solum is 30 to 48 inches thick. It is very strongly acid to slightly acid except where the soil has been limed.

The A1 horizon, where present, is very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) and is 3 to 5 inches thick. The A2 horizon is typically grayish brown (10YR 5/2) and is 2 to 8 inches thick. The B horizon has a hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. It is loam, gravelly loam, sandy loam, gravelly sandy loam, sandy clay loam, and light clay loam.

Jimtown soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Chili soils, the moderately well drained Bogart soils, the poorly drained Damascus soils, and the very poorly drained Olmsted soils. They are commonly adjacent to Bogart, Fitchville, and Chili soils. The Jimtown soils are similar in texture to Bogart and Chili soils, but they have more gray color in the B horizon. Jimtown soils have less silt and more sand that Fitchville soils. They are similar to Haskins soils but lack the underlying glacial till or lacustrine material characteristic of these soils.

JtA—Jimtown loam, 0 to 2 percent slopes. This is a nearly level soil that has the profile described as representative of the series. Areas are mainly irregular in shape and range from 5 to 20 acres in size.

Included with this soil in mapping are small areas of the wetter Damascus soils in low-lying areas and in shallow depressions. The surface layer is silt loam in some areas. Small areas of the more silty Fitchville soils are also included in mapping.

Runoff is slow. Seasonal wetness is a moderate limitation to use of this soil for cultivated crops and for many nonfarm uses. Capability unit IIw-4; woodland suitability group 2w3.

JtB—Jimtown loam, 2 to 6 percent slopes. This is a gently sloping soil that is generally in areas less than 10 acres in size and irregular in shape. Included with this soil in mapping are small areas of the more silty Fitchville soils adjacent to glacial uplands. Some areas that have a surface layer of silt loam are also included.

Runoff is slow, and the hazards of wetness and erosion are moderate if this soil is cultivated. Seasonal wetness is the major limitation for many nonfarm uses of this soil. Capability unit IIw-4; woodland suitability group 2w3.

Lakin Series

The Lakin series consists of deep, well drained, gently sloping to sloping soils that formed in sandy outwash. These soils are on kames, terraces, and uplands.

In a representative profile the surface layer is dark brown loamy sand 9 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown loamy sand to a depth of 16 inches, it is brown sand to 23 inches, and between depths of 23 and 47 inches it is brown sand that has thin bands of dark brown. The substratum to a depth of 60 inches is loose brown sand.

Lakin soils have a deep root zone and a low available water capacity. Permeability is rapid, and these soils are droughty. They have a very low capacity for storing and releasing plant nutrients.

Most areas of Lakin soils were cleared of trees and were cultivated, but now they are idle.

Representative profile of Lakin loamy sand, 2 to 6 percent slopes, in Windham Township, 50 feet north of Ohio Turnpike, 2,800 feet west of the Trumbull County line:

Ap—0 to 9 inches; dark brown (7.5YR 4/4) loamy sand; weak very fine granular structure; very friable; strongly acid; abrupt smooth boundary.

B21—9 to 16 inches; strong brown (7.5YR 5/6) loamy sand; single grained; very friable; common dark brown (7.5YR 4/4) fillings in root and worm channels; strongly acid; clear wavy boundary.

B22—16 to 23 inches; brown (7.5YR 5/4) sand; single grained; very friable; very strongly acid; clear wavy boundary.

B23—23 to 29 inches; brown (7.5YR 5/4) sand; single grained; loose; several thin dark brown (7.5YR 4/4) lamellae; very strongly acid; clear wavy boundary.

B24—29 to 35 inches; brown (7.5YR 5/4) sand; single grained; loose; several thin dark brown (7.5YR 4/4) lamellae; very strongly acid; clear wavy boundary.

B25—35 to 47 inches; brown (7.5YR 5/4) sand; single grained; loose; dark brown (7.5YR 4/4) lamellae that range from ¼ inch to ¾ inch in thickness and have a combined thickness of 3½ to 4 inches; lamellae friable; very strongly acid; gradual wavy boundary.

C—47 to 60 inches; brown (7.5YR 5/4) sand; single grained; loose; few pebbles; strongly acid.

The solum is medium acid to very strongly acid.

The Ap horizon has a hue of 10YR to 7.5YR, value of 4 or 5, and chroma of 3 through 6. The B horizon is mainly loamy sand or sand, but it is also loamy fine sand in places. Lamellae in the B horizon are ¼ to 1 inch thick and are darker in color than the matrix.

The Lakin soils are near the well drained Chili and Oshtemo soils. They have more sand than the Chili and Oshtemo soils, and have banding in the B horizon that those soils lack.

LaB—Lakin loamy sand, 2 to 6 percent slopes. This is a gently sloping soil that occupies variable shaped areas on kames, terraces, and uplands. It has the profile described as representative for the series. Included in mapping are small areas of Oshtemo soils.

Runoff is slow, and water moves readily into this

soil. The soil is droughty, and the hazard of erosion is moderate if this soil is cultivated. The surface layer has good tilth, although it is commonly low in content of organic matter. The rapid permeability of this soil is a severe limitation for sewage lagoons and sanitary landfills. There are few limitations for most other nonfarm uses. Capability unit IIIs-1; woodland suitability group 3s1.

LaC—Lakin loamy sand, 6 to 12 percent slopes. This is a sloping soil on kames on rolling landscapes. Slopes are generally short and irregular. Most areas of this soil are less than 10 acres in size.

This soil commonly adjoins areas of the more gravelly Chili and Oshtemo soils. It is susceptible to soil blowing and water erosion if it is cultivated. Droughtiness is also a limitation to the use of this soil for cultivated crops.

Slope is the major limitation for most nonfarm uses. Rapid permeability is the major limitation for sewage lagoons and sanitary landfills. Capability unit IIIs-1; woodland suitability group 3s1.

Linwood Series

The Linwood series consists of poorly drained organic soils that formed in organic deposits 16 to 51 inches thick. These soils are in depressions on stream terraces.

In a representative profile the surface layer is black and very dark brown friable muck that extends to a depth of 29 inches. Below the muck, to a depth of 60 inches, the soil material is very dark grayish brown or dark grayish brown silt loam.

Linwood soils have a root zone that is moderately deep in summer when the water table is lowest. The available water capacity is high. Permeability is rapid in the organic layer and moderate in the underlying mineral material. The water table is at or near the surface for long periods unless these soils have been artificially drained.

Representative profile of Linwood muck, within Kent city limits, about 800 feet west of Akron-Kent Boulevard, 500 feet east of the railroad tracks, about 1,800 feet north of State Route 59:

Oa1—0 to 9 inches; black (10YR 2/1) broken face and rubbed sapric material; no fibers rubbed and unrubbed; moderate fine and medium granular structure; very friable; many roots: strongly acid; abrupt smooth boundary.

Oa2—9 to 16 inches; black (10YR 2/1) broken face and rubbed sapric material; about 5 percent fiber, no fiber rubbed; moderate fine subangular blocky structure; friable; many roots; strongly acid; gradual smooth boundary.

Oa3—16 to 29 inches; very dark brown (10YR 2/2) broken face and rubbed sapric material; 5 to 10 percent fiber, no fiber rubbed; massive; friable; common roots; strongly acid; clear smooth boundary.

IIC1g—29 to 36 inches; very dark grayish brown (2.5Y 3/2) silt loam; massive; friable; medium acid; clear smooth boundary.

IIC2g—36 to 60 inches; dark grayish brown (2.5YR 4/2) silt loam; massive; friable; a few shells; neutral.

Depth of the organic material is 16 to 51 inches. The subsurface tier is sapric material. The organic material is strongly acid to medium acid. The underlying mineral layer is medium acid to moderately alkaline.

The surface tier is very dark brown (10YR 2/2) or black (10YR 2/1, N2/0) on broken face and rubbed. The organic part of the subsurface and bottom tiers is dark brown (7.5YR 3/2), very dark brown (10YR 2/2), or black (10YR 2/1) on broken face and rubbed. The IIC horizon has a hue of 10YR through 5Y, value of 3 through 6, and chroma of 1 or 2. It ranges from fine sandy loam to silt loam.

Linwood soils are on landscapes similar to Carlisle and Olmsted soils and may be adjacent to these soils. They formed in thinner deposits of organic material than Carlisle soils. Linwood soils formed in organic material, whereas Olmsted soils formed in mineral material.

Ld—Linwood muck. This is a level soil on the outer edge of larger areas of Carlisle muck. Most areas of this soil are less than 5 acres in size. Included in mapping are small areas that are underlain by clayey material and are generally more difficult to drain. The organic material will subside if this soil is artificially drained.

The hazard of wetness is severe if this soil is cultivated. Drainage outlets are difficult to establish in some areas. Wetness and instability are the major limitations of this soil for most nonfarm uses. Capability unit IIIw-2; not assigned to a woodland suitability group.

Lorain Series

The Lorain series consists of deep, very poorly drained, nearly level soils that formed in lacustrine sediments. These soils are in low areas on old glacial lakebeds and in depressions on till plains.

In a representative profile the surface layer is very dark gray silty clay loam about 8 inches thick. The subsoil extends to a depth of 36 inches and is firm mottled gray silty clay loam and silty clay. The substratum is stratified grayish silty clay loam to fine sand to a depth of 77 inches.

Lorain soils have a moderately deep root zone in summer if the water table is low or if the soil is drained. The available water capacity is moderate to high. Permeability is slow in the subsoil and substratum. These soils are saturated with free water for a long period late in winter, spring, and early in summer.

Most areas of Lorain soils are no longer cultivated. Most areas lack adequate drainage for crop production. Many areas are in pasture, and some are wooded.

Representative profile of Lorain silty clay loam, in Streetsboro Township, 1.1 mile southeast of Streetsboro, 600 feet west of State Route 14 across from Valley Brook Village:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam; strong coarse granular structure; friable; neutral; abrupt smooth boundary.

B1tg—8 to 14 inches; gray (5Y 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; strong medium and coarse angular blocky structure parting to weak thick platy; firm; very dark (10YR 3/1) vertical ped face coating; thin very patchy clay films on ped faces; neutral; clear smooth boundary.

B2tg—14 to 22 inches; gray; (5Y 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; dark gray (10YR 4/1) vertical ped face coatings; thin patchy clay films on vertical ped faces; thin very patchy clay films on horizontal ped faces; strongly acid; clear wavy boundary.

B31tg—22 to 30 inches; gray (5Y 5/1) silty clay loam;

common medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; firm; thin patchy dark grayish brown (10YR 4/2) coatings on vertical ped faces; thin very patchy clay films mainly on vertical ped faces; a few dark yellowish brown (10YR 4/4) "pipestone" concretions; strongly acid; clear wavy boundary.

B32g—30 to 36 inches; gray (5Y 5/1) light silty clay; few medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; firm, neutral; clear wavy boundary.

C1—36 to 56 inches; grayish brown (2.5Y 5/2) heavy silty clay loam that has a few lenses of silt loam; massive; firm; patchy dark (10YR 3/3) stains in vertically elongated zones; mildy alkaline; abrupt smooth boundary.

IIC2—56 to 59 inches; dark gray (5Y 4/1) heavy sandy loam; massive; friable; mildly alkaline; abrupt smooth boundary.

IIIC3—59 to 66 inches; grayish brown (2.5Y 5/2) silty clay loam; massive; firm; mildly alkaline; abrupt smooth boundary.

IVC4—66 to 77 inches; dark gray (5Y 4/1) stratified fine sand and silt, massive; friable; mildly alkaline.

The solum is 30 to 50 inches thick. It is strongly acid to neutral.

The Ap and A1 horizons are very dark gray (10YR 3/1) or black (10YR 2/1). The B horizon has a hue of 10YR, 2.5Y, or N, value of 4 or 5, and chroma of 0, 1, or 2. The Bt horizon is typically heavy silty clay loam, but it is silty clay or clay in places. The C horizon is dominantly gray and ranges from silty clay loam to fine sand.

Lorain soils are the very poorly drained member of a drainage sequence that includes the somewhat poorly drained Caneadea soils and the poorly drained Canadice soils. They are commonly adjacent to Caneadea and Canadice soils and the Sebring variant. Lorain soils have a darker A horizon than Caneadea and Canadice soils and have more clay in the B horizon than the Sebring variant.

Ln—Lorain silty clay loam. This is a nearly level soil in depressions on till plains and on old glacial lakebeds. The most extensive areas of this soil are in Aurora and Streetsboro Townships. Most areas are less than 10 acres in size. The surface layer is high in organic-matter content.

Included in mapping are small areas that have a dark surface layer that is more than 10 inches thick. Some areas have a thin mucky surface layer, particularly in the lowest part of the depressions. Small areas of Sebring soils are also included in some places.

The hazard of wetness is severe if this soil is cultivated. Most areas have inadequate artificial drainage for intensive use; consequently, many areas are no longer cultivated. A high water table and slow permeability are the major limitations for most nonfarm uses. Capability unit IIIw–7; woodland suitability group 2w1.

Loudonville Series

The Loudonville series consists of moderately deep, gently sloping to steep soils that formed partly in glacial till and partly in residuum weathered from the underlying sandstone bedrock. These soils are on uplands throughout the county.

In a representative profile the surface layer is dark grayish brown silt loam 6 inches thick. The upper part of the subsoil, extending to a depth of 19 inches, is brown and yellowish brown silt loam. The lower part of the subsoil, extending to a depth of 31 inches, is firm yellowish brown clay loam and loam. Sandstone bedrock is at a depth of 31 inches.

Loudonville soils have a moderately deep root zone and a moderate to low available water capacity. Permeability above the sandstone bedrock is moderate. These soils warm up and dry out quickly in spring.

Most Loudonville soils in the county are wooded or are in idle areas of former cropland. Some areas are cultivated; the main crops are corn and grass-legume hay.

Representative profile of Loudonville silt loam, 2 to 6 percent slopes, in Hiram Township, 1¾ miles north of Hiram, 1,000 feet west of State Route 700, and about 600 feet north of Winchell Road:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable; many fine roots; 1 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B1—6 to 11 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; common fine roots; thin very patchy brown (10YR 4/3) clay films on ped faces; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—11 to 19 inches; yellowish brown (10YR 5/4) silt loam; moderate to strong medium subangular structure; firm; few fine roots; thin patchy brown (10YR 4/3) clay films on ped faces; 2 percent coarse fragments; very strongly acid; gradual smooth boundary.

IIB22t—19 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on ped faces; 4 percent coarse fragments; very strongly acid; clear smooth boundary.

IIB3—24 to 31 inches; yellowish brown (10YR 5/4) loam; common medium faint yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; brown (10YR 5/3) silt coatings on ped faces; thin very patchy brown clay films on ped faces; 10 to 15 percent sandstone fragments 1 to 3 inches in diameter; strongly acid; abrupt smooth boundary.

IIIR—31 inches; fractured sandstone bedrock.

The thickness of the solum and depth to bedrock are 20 to 40 inches. Reaction is very strongly acid to medium acid.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The A1 horizon is very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2) and is 2 to 3 inches thick. The A2 horizon is yellowish brown (10YR 5/4) or brown (10YR 5/3) and is 4 to 7 inches thick. The B horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3, 4, or 5. Mottles are in some profiles, but chroma of 2 or less do not occur in the upper 10 inches of the Bt horizon. The B horizon ranges from loam or silt loam to clay loam, and the IIB3 horizon is channery in some places. The underlying bedrock commonly has some fractures.

Loudonville soils are on landscapes similar to Wooster, DeKalb, and Hornell soils. They are shallower to bedrock than Wooster soils and lack the fragipan characteristic of Wooster soils. Loudonville soils have less sand and fewer stone fragments than Dekalb soils. They are underlain by sandstone bedrock, whereas the Hornell soils are underlain by shale. Loudonville soils are associated with the somewhat poorly drained Mitiwanga soils and with the moderately well drained Mitiwanga variant.

LoB—Loudonville silt loam, 2 to 6 percent slopes. This is a gently sloping soil on the upper part of hillsides and on hill crests. It has the profile described as representative of the series. It is commonly adjacent to areas of the well drained Dekalb and Wooster soils, and occasionally it is adjacent to the moderately well drained Rittman, Ellsworth, and Canfield soils.

Included with this soil in mapping are some small wet areas where the soil is grayer and more mottled

than Loudonville soils. Small areas of Rittman and Wooster soils and a few built-up urban areas are also included.

Most of the larger areas of this soil are used for woodland or crops. Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Moderate depth to bedrock is the major limitation to some nonfarm uses of this soil. Capability unit IIe–3; woodland suitability group 2o1.

LoC—Loudonville silt loam, 6 to 12 percent slopes. This is a sloping soil on side slopes and ridgetops.

Included in mapping are a few springs and seep areas where the subsoil is gray and mottled. Also included are small areas where depth to bedrock is more than 40 inches, and a few moderately eroded areas in cultivated fields.

Areas of this soil are used for cultivated crops, pasture, or woodland. The hazard of erosion is severe if this soil is cultivated. Slope and a moderate depth to bedrock are the major limitations for many nonfarm uses of this soil. Capability unit IIIe–5; woodland suitability group 2o1.

LoC2—Loudonville silt loam, 6 to 12 percent slopes, moderately eroded. This is a sloping soil on the upper part of hillsides. Areas are elongated. It has a profile similar to the one described as representative of the series, except that much of its original surface layer has been lost through erosion. The present plow layer consists of a mixture of the original surface layer and subsoil material. The organic-matter content and available water capacity have been lowered slightly as a result of erosion. This soil is subject to crusting.

Included in mapping are a few severely eroded areas and a few areas of Urban land.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. A moderate depth to bedrock and slope are limitations to some nonfarm uses of this soil. Capability unit IIIe–5; woodland suitability group 2o1.

LoD2—Loudonville silt loam, 12 to 18 percent slopes, moderately eroded. This is a moderately steep soil on narrow strips on upland hillsides and side slopes adjacent to drainageways. Erosion has lowered the available water capacity, the organic-matter content of the surface layer, and soil fertility. Included in mapping are a few areas of Dekalb soils.

Runoff is rapid, and the hazard of erosion is very severe if this soil is cultivated. Slope and moderate depth to bedrock are the major limitations of this soil for most nonfarm uses. Capability unit IVe–2; woodland suitability group 2r1.

LoE—Loudonville silt loam, 18 to 25 percent slopes. This is a steep soil on upland hillsides and side slopes adjacent to drainageways. Included in mapping are some small areas of Dekalb soils.

Runoff is very rapid. Slope is the major limitation to the use of this soil for cultivated crops. This soil is best suited to pasture or hay. Moderate depth to bedrock and slope are the major limitations for many nonfarm uses. Capability unit VIe–2; woodland suitability group 2r1.

Mahoning Series

The Mahoning series consists of deep, somewhat poorly drained, nearly level to gently sloping soils that formed in silty clay loam or clay loam glacial till. These soils are on uplands in the northwestern and eastern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The subsoil is firm, mottled silty clay loam 26 inches thick. It is light brownish gray in the upper 7 inches, yellowish brown in the middle 9 inches, and dark yellowish brown and yellowish brown in the lower 10 inches. The substratum to a depth of 60 inches is dark yellowish brown and brown silty clay loam till.

Mahoning soils have a moderately deep root zone and moderate available water capacity. Permeability is slow in the subsoil and slow in the underlying glacial till. These soils are saturated with free water late in winter and in spring. They are slow to dry out in spring unless they have been artificially drained.

Many areas of Mahoning soils that are cleared of trees are not presently cultivated. Some areas are used as pasture, and others are wooded. Cultivated crops include grass-legume meadow, wheat, and corn. Most areas of Mahoning soils are not adequately drained for intensive crop production.

Representative profile of Mahoning silt loam, 2 to 6 percent slopes, in Freedom Township, 9 miles northeast of Ravenna, 4 miles south of Garrettsville, 60 feet east of Slagle Road, and 1,300 feet south of State Route 303:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

B21t—8 to 15 inches; light brownish gray (10YR 6/2) silty clay loam; few coarse distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; grayish brown (10YR 5/2) ped faces; thin very patchy clay films in voids; about 2 percent coarse fragments; strongly acid; gradual smooth boundary.

B22t—15 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; strong medium prismatic structure; firm; light brownish gray (2.5Y 6/2) ped faces; thin patchy clay films on ped faces; about 7 percent coarse fragments; very strongly acid; clear smooth boundary.

B3t—24 to 34 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) silty clay loam; many fine faint yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; light brownish gray (2.5Y 6/2) ped faces; thin patchy clay films on ped faces; about 10 percent coarse fragments; neutral; clear smooth boundary.

C1—34 to 41 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct light olive brown (2.5Y 5/4) mottles; weak very thick platy structure; firm; few light brownish gray (2.5Y 6/2) vertical seams; about 5 percent coarse fragments; mildly alkaline; gradual smooth boundary.

C2—41 to 60 inches; brown (10YR 5/3) silty clay loam; common coarse faint yellowish brown (10YR 5/4) mottles; massive; firm; some gray (10YR 6/1) vertical seams of lime accumulation; about 6 percent coarse fragments; moderately alkaline.

The solum is 30 to 44 inches thick. Content of coarse fragments ranges from 2 to 10 percent below the surface layer. The upper part of the solum is strongly acid to very strongly acid except where the soil has been limed. Horizons deeper in the solum are progressively less acid, and the lower part of the B3 horizon is commonly neutral or mildly alkaline.

The Ap horizon is dark grayish brown (10YR 4/2, 2.5Y 4/2) or dark brown (10YR 4/3). In undisturbed areas the A1

horizon is very dark gray (10YR 3/1) to black (10YR 2/1) and is 1 to 3 inches thick. In these areas the A2 horizon is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) and is 4 to 6 inches thick. The B2 horizon is yellowish brown (10YR 5/4), grayish brown (2.5Y 5/2) light brownish gray (10YR 6/2), and dark yellowish brown (10YR 4/4). Chroma of 2 or less are dominant on ped faces. The B2 horizon ranges from silty clay loam to silty clay and clay. The C horizon is clay loam or silty clay loam.

Mahoning soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained Ellsworth soils and the poorly drained Trumbull soils. Mahoning soils are commonly adjacent to Ellsworth, Canadice, Trumbull, Remsen, Wadsworth, Caneadea, Mitiwanga, and Fitchville soils. These soils lack the fragipan characteristic of Wadsworth soils. They have more coarse fragments than Canadice and Caneadea soils. Mahoning soils have more clay and less silt in the B and C horizons than Fitchville soils and less clay in the B horizon than Remsen soils. Bedrock is not within a depth of 40 inches in Mahoning soils as it is in Mitiwanga soils.

MgA—Mahoning silt loam, 0 to 2 percent slopes. This is a nearly level soil in upland areas between drainageways. Most areas of this soil are more than 10 acres in size.

Included in mapping are small areas of poorly drained Trumbull soils in shallow upland drainageways and in depressions.

Runoff is slow to ponded, and seasonal wetness is a severe limitation if this soil is cultivated. This soil can also be droughty in summer if rains are not timely. Seasonal wetness and slow permeability are the major limitations to many nonfarm uses of this soil. Capability unit IIIw–4; woodland suitability group 2w3.

MgB—Mahoning silt loam, 2 to 6 percent slopes. This is a gently sloping soil in slightly convex upland areas. Many areas of this soil are broad and range to about 1,000 acres in size. They are long and irregular in shape. Slopes are generally less than 5 percent.

Included with this soil in mapping are a few small areas of Wadsworth soils that are adjacent to this soil; a few areas of moderately eroded soil; and small areas of better drained Ellsworth soils, particularly where slope is 4 to 6 percent. Also included are a few areas where bedrock is at a depth of 40 to 60 inches.

Runoff is medium to rapid. There is internal lateral movement of water on long slopes that tends to collect in low areas. These low areas are slow to dry out in spring. Seasonal wetness is a severe limitation to the use of this soil for cultivated crops. Erosion is a hazard, especially if this soil is used for row crops. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit IIIw–4; woodland suitability group 2w3.

MnB—Mahoning-Urban land complex, undulating. This mapping unit consists of 20 to 60 percent undisturbed Mahoning soils on undeveloped lots, in some parts of developed lots, and in small wooded areas; 25 to 50 percent borrow or fill areas; and 15 to 30 percent areas of buildings, driveways, and streets. It is in urban or industrialized areas, and much of the natural soil has been destroyed or covered as a result of grading and digging.

In fill areas, 1 to 3 feet of fill material overlies the undisturbed Mahoning soils or inclusions of Trumbull or Remsen soils. The fill material consists of Mahoning subsoil material and, in some places, of limy glacial till. In borrow areas, subsoil and substratum material are exposed.

The surface layer in graded areas commonly has a low content of organic matter and poor tilth. It has a narrow range of moisture content suitable for tillage. The surface layer is subject to crusting after rainfall.

Seasonal wetness is a limitation, particularly if grading has resulted in depressed or bowl-shaped areas. The hazard of erosion is severe on slopes and where the soil has been left bare. Measures are needed to control gullying and sedimentation during construction. Not assigned to a capability unit or woodland suitability group.

Mitiwanga Series

The Mitiwanga series consists of moderately deep, somewhat poorly drained, nearly level to gently sloping soils that formed in glacial till 20 to 40 inches thick overlying sandstone bedrock. These soils are on undulating uplands.

In a representative profile the surface layer is dark grayish brown silt loam 6 inches thick. The subsoil is yellowish brown, brown, and dark yellowish brown silty clay loam that has gray mottles and coatings. It extends to a depth of 31 inches. Sandstone bedrock is at a depth of 31 inches.

Mitiwanga soils have a moderately deep root zone and a moderate available water capacity. Permeability is moderate. These soils have a water table near the surface late in winter and in spring.

Most areas of Mitiwanga soils are not cultivated. Some areas are used as pasture, and others are wooded. Cultivated areas are used mostly for grass-legume meadow, wheat, or corn. Most areas of Mitiwanga soils are not adequately drained for intensive crop production.

Representative profile of Mitiwanga silt loam, 0 to 2 percent slopes, in Windham Township, 1.2 miles southeast of Windham, 300 feet south of Smalley Road, and 1,800 feet east of Windham Road:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; 2 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B1—6 to 11 inches; yellowish brown (10YR 5/4) light silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; light brownish gray (10YR 6/2) ped faces; thin very patchy clay films on ped faces; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—11 to 16 inches; brown (10YR 5/3) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; light brownish gray (10YR 6/2) ped faces; thin patchy clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—16 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct gray (5Y 5/1) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; light brownish gray (2.5Y 6/2) ped faces; thin patchy clay films on ped faces and in pores; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B23t—22 to 31 inches; brown (10YR 4/3) silty clay loam; many medium distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse prismatic structure;

firm; grayish brown (2.5Y 5/2) ped faces; thin patchy clay films on vertical ped faces and in pores; thin very patchy clay films along horizontal partings; few black (10YR 2/1) stains; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

IIR—31 inches; sandstone bedrock.

Depth to sandstone bedrock is 20 to 40 inches. Reaction is strongly acid or very strongly acid throughout except where the soil has been limed. The content of coarse fragments ranges from 2 to 15 percent throughout.

The Ap horizon is dark grayish brown (10YR 4/2, 2.5Y 4/2). The ped interiors of the B horizon are mottled but have a hue of 10YR, value of 4 to 5, and chroma of 3 or 4. The ped exteriors have dominant colors that have chroma of 0 through 2 and value of 4, 5, or 6. The Bt horizon is silty clay loam.

In Portage County, Mitiwanga soils have slightly more clay in the B horizon than Mitiwanga soils mapped elsewhere. However, this difference does not alter the use and management of the soils.

Mitiwanga soils are associated with the well drained Loudonville soils and the moderately well drained Mitiwanga variant. They are commonly adjacent to Mahoning soils which do not have bedrock at a depth of 40 inches. Mitiwanga soils are on landscapes similar to Hornell soils, but they are underlain by sandstone bedrock, whereas Hornell soils are underlain by shale bedrock.

MtA—Mitiwanga silt loam, 0 to 2 percent slopes. This is a nearly level soil in wide flat areas on broad ridgetops of sandstone hills in the eastern part of the county. It has the profile described as representative of the series. Most areas of this soil are more than 5 acres in size.

Included with this soil in mapping are small areas of somewhat poorly drained Mahoning or Remsen soils that are deeper to sandstone bedrock.

Runoff is slow to ponded, and seasonal wetness is a severe limitation if this soil is cultivated. Seasonal wetness, slow permeability, and moderate depth to bedrock are limitations for many nonfarm uses. Capability unit IIIw–4; woodland suitability group 3w1.

MtB—Mitiwanga silt loam, 2 to 6 percent slopes. This is a gently sloping soil on uplands, commonly at a slightly higher elevation than surrounding soils. Most areas of this soil are 5 to 10 acres in size. They are rounded in shape. Included in mapping are small areas of the somewhat poorly drained Mahoning soils that are deeper to sandstone bedrock.

This soil is saturated with water in winter and early in spring, and it is droughty in summer unless rainfall is timely. Runoff is medium, and there is a hazard of erosion if the soil is left bare. Excessive wetness early in the growing season, droughtiness in summer, and a moderate depth to bedrock are the major limitations to the use of this soil for cultivated crops. Moderate depth to bedrock and a seasonal water table are the major limitations for many nonfarm uses. Capability unit IIIw–4; woodland suitability group 3w1.

Mitiwanga Variant

These are moderately deep, moderately well drained, gently sloping to sloping soils that formed in glacial till overlying sandstone bedrock. They are mainly in the eastern part of the county.

In a representative profile, the surface layer is silt loam 12 inches thick. The upper 9 inches is brown, and the lower 3 inches is dark yellowish brown. The subsoil, extending to a depth of 39 inches, is yellowish brown and dark yellowish brown silt loam and silty clay loam. It has grayish mottles below a depth of 16 inches. Sandstone bedrock is at a depth of 39 inches.

These soils have a moderately deep root zone and a moderate available water capacity. Permeability is slow in the subsoil. The soil is saturated with free water in winter and in spring, and it is slow to dry out.

Most areas of these soils are not cultivated. Some areas are used as pasture, and some are wooded. Cultivated areas are used mostly for grass-legume meadow, wheat, and corn.

Representative profile of Mitiwanga silt loam, moderately well drained variant, 2 to 6 percent slopes, in Edinburg Township, 4½ miles southeast of Ravenna, 350 feet northeast of State Route 14, and 1,000 feet northwest of Booth Road:

Ap1—0 to 9 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common fine very dark grayish brown (10YR 3/2) concretions; about 2 percent coarse fragments; medium acid; abrupt smooth boundary.

Ap2—9 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable; few fine very dark grayish brown (10YR 3/2) concretions; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21t—12 to 16 inches; yellowish brown (10YR 5/4) heavy silt loam; moderate medium subangular blocky structure; friable; thin very patchy clay films on vertical ped faces and in pores; root channels filled with brown (10YR 5/3) silt loam; about 3 percent coarse fragments; strongly acid; clear smooth boundary.

B22t—16 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (2.5Y 6/2) loam; common fine distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse subangular blocky structure; firm; thin very patchy clay films on ped faces; a few root channels filled with brown (10YR 5/3) silt loam; about 3 percent coarse fragments; very strongly acid; clear smooth boundary.

B23t—20 to 36 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct light gray (10YR 7/1) and few fine prominent yellowish red (5YR 4/6) mottles; moderate medium prismatic structure; firm; light brownish gray (2.5Y 6/2) ped surfaces; thin patchy clay films on ped faces; about 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B3—36 to 39 inches; yellowish brown (10YR 5/4) silty clay loam; subangular blocky structure; firm; thin patchy light brownish gray (2.5Y 6/2) coatings on ped faces; about 15 percent coarse fragments; very strongly acid; abrupt smooth boundary.

IIR—39 inches; sandstone bedrock.

The depth to sandstone bedrock ranges from 20 to 40 inches. The solum below the Ap horizon is strongly acid to very strongly acid. The content of coarse fragments ranges from 2 to 15 percent throughout.

The Ap horizon is dark grayish brown (10YR 4/2), dark brown (10YR 4/3), or dark yellowish brown (10YR 4/4). The B2 horizon is yellowish brown (10YR 5/4), brown (10YR 4/3), and dark yellowish brown (10YR 4/4). It is generally silty clay loam, but the upper part of the B2 horizon is heavy silt loam in some places.

The Mitiwanga variant is associated with the well drained Loudonville soils and the somewhat poorly drained Mitiwanga soils. It is commonly adjacent to these soils.

MvB—Mitiwanga silt loam, moderately well drained variant, 2 to 6 percent slopes. This is a gently sloping soil on uplands, mainly in the eastern part of the county. It has the profile described as representative of the series. Included in mapping are small areas of the wetter, somewhat poorly drained Mitiwanga soils,

particularly in less sloping areas where water from surrounding slopes accumulates.

Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Moderate depth to bedrock and seasonal wetness are the major limitations to some nonfarm uses of this soil. Capability unit IIIe-4; woodland suitability group 3o1.

MvC—Mitiwanga silt loam, moderately well drained variant, 6 to 12 percent slopes. This is a sloping soil that occupies elongated areas on hillsides. Included in mapping are small areas of the wetter, somewhat poorly drained Mitiwanga soils, particularly in drainageways where water from surrounding slopes accumulates.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. The moderate depth to bedrock and seasonal wetness are the major limitations to some nonfarm uses of this soil. Capability unit IVe-1; woodland suitability group 3o1.

Olmsted Series

The Olmsted series consists of deep, very poorly drained, nearly level to slightly depressional soils that formed in loamy, sandy, and gravelly outwash. These soils are on outwash terraces throughout the county.

In a representative profile the surface layer is very dark grayish brown loam 9 inches thick. The subsoil extends to a depth of 27 inches and is mottled gray and light brownish gray loam and sandy loam. The substratum to a depth of 60 inches is stratified loamy sand, sand, and gravelly sand.

Olmsted soils have a moderately deep to deep root zone in summer when the water table is low and in drained areas. The water table is high in winter, spring, and early in summer. These soils have a moderate available water capacity. Permeability is moderately rapid in the subsoil and rapid in the substratum.

Most areas of Olmsted soils are cleared but are no longer cultivated. Many areas do not have adequate artificial drainage for cultivated crops. Artificial drainage is necessary for optimum plant growth.

Representative profile of Olmsted loam, in Shalersville Township, 1 mile west of Shalersville, 800 feet east of Infirmary Road, and 1,000 feet south of State Route 303:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium granular structure; friable; about 2 percent pebbles; neutral; abrupt smooth boundary.

B1g—9 to 11 inches; gray (N 5/0) loam; many medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; about 2 percent pebbles; neutral; clear smooth boundary.

B21tg—11 to 18 inches; light brownish gray (2.5Y 6/2) loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; thin patchy clay films mainly in pores and bridging sand grains; about 2 percent pebbles; neutral; clear smooth boundary.

B22tg—18 to 27 inches; gray (N 5/0) sandy loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin patchy clay films bridging sand grains; common brown (10YR 4/3) zones of sandy clay loam; 1 percent pebbles; neutral; clear wavy boundary.

C1—27 to 36 inches; grayish brown (2.5Y 5/2) loamy sand that has a few zones of very dark gray (10YR 3/1); single grained; friable; neutral; abrupt smooth boundary.

C2—36 to 50 inches; gray (5Y 5/1) sand; single grained; loose; neutral; abrupt smooth boundary.

C3—50 to 60 inches; dark gray (5Y 4/1) gravelly sand; single grained; loose; neutral.

The solum is 27 to 40 inches thick. It is strongly acid to neutral. Content of coarse fragments ranges from 0 to 10 percent throughout.

The Ap horizon is black (10YR 2/1), very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2), or very dark gray (10YR 3/1). The Btg horizon has a hue of 10YR, 2.5Y, or 5Y, or is neutral, value of 4 through 6, and chroma of 0, 1, or 2.

Olmsted soils are the very poorly drained member of a drainage sequence that includes the well drained Chili soils, the moderately well drained Bogart soils, the somewhat poorly drained Jimtown soils, and the poorly drained Damascus soils. They are commonly adjacent to Damascus, Carlisle, and Linwood soils and the Sebring variant. Olmsted soils have a darker colored A horizon than Damascus soils. They are mineral, whereas Carlisle and Linwood soils are organic. They are coarser throughout than the Sebring variant.

Od—Olmsted loam. This is a nearly level soil on outwash terraces. Most areas are 2 to 5 acres in size.

Included with this soil in mapping are areas of the Sebring variant. Also included are some areas of soils near Black Brook north of Mantua Center that have less clay than is representative of the series. A few included areas have a surface layer of silt loam.

Runoff is slow to ponded, and wetness is a moderate limitation to farming. Excessive wetness is the major limitation for most nonfarm uses. Capability unit IIw-5; woodland suitability group 2w1.

Orrville Series

The Orrville series consists of deep, somewhat poorly drained, nearly level soils that formed in loamy alluvium on flood plains throughout the county.

In a representative profile the surface layer is dark grayish brown silt loam 3 inches thick. The subsoil extends to a depth of 26 inches; it is mottled light yellowish brown, light brownish gray, and gray silt loam and loam. The substratum to a depth of 60 inches is dark gray sandy loam and loamy sand.

Orrville soils have a deep root zone in summer when the water table is low and in drained areas. The available water capacity is high, and permeability is moderate. These soils are subject to occasional flooding, and they have a water table near the surface late in winter and in spring.

Orrville soils are mainly wooded or are used as pasture. A few areas are cultivated but lack adequate drainage and flood protection.

Representative profile of Orrville silt loam, in Hiram Township; 1.7 miles west of Garrettsville, 200 feet south of State Route 82, and 50 feet west of Silver Creek:

Ap—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

B1g—3 to 8 inches; light yellowish brown (2.5Y 6/4) silt loam; common fine distinct brown (7.5YR 4/4) and light brownish gray (2.5Y 6/2) mottles; moderate

fine and medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21g—8 to 18 inches; light yellowish brown (2.5Y 6/4) loam; common medium distinct brown (7.5YR 5/4) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; light brownish gray (2.5Y 6/2) ped faces; common fine concretions; slightly acid; clear wavy boundary.

B22g—18 to 21 inches; light brownish gray (2.5Y 6/2) loam; common medium and coarse distinct yellowish brown (10YR 5/6) and common medium distinct reddish brown (5YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine concretions; medium acid; abrupt smooth boundary.

B23g—21 to 26 inches; gray (5Y 5/1) silt loam; common medium distinct yellowish brown (10YR 5/6) and reddish brown (5YR 5/4) and many coarse distinct light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; firm; medium acid; abrupt smooth boundary.

C1—26 to 36 inches; dark gray (5Y 4/1) sandy loam; massive; friable; thin zones of organic matter; slightly acid; abrupt smooth boundary.

C2—36 to 60 inches; dark gray (5Y 4/1) loamy sand; single grained; very friable; thin zones of organic matter; slightly acid.

The solum is 24 to 40 inches thick. It is medium acid to slightly acid except where the soil has been limed.

The A1 or Ap horizon is dark grayish brown (10YR 4/2) or very dark grayish brown (10YR 3/2). The B horizon is dominantly loam and silt loam but includes layers of sandy loam or light silty clay loam. The B horizon has a hue of 10YR, 2.5Y, or 5Y, value of 4 through 6, and chroma of 1 through 4. The C horizon is stratified silt loam, loamy sand, and sandy loam.

Orrville soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Tioga soils and the poorly drained Holly soils. They are commonly adjacent to those soils. Orrville soils have a B horizon that is grayer than that of Tioga soils and less gray than that of Holly soils.

Or—Orrville silt loam. This is a nearly level soil on narrow flood plains. Areas of this soil are generally less than 50 acres in size. Included in mapping are areas of poorly drained Holly soils in low areas and in stream meander channels and areas of Tioga soils next to the stream.

Runoff is very slow, and there is a hazard of moderate wetness and periodic flooding if this soil is cultivated. Susceptibility to flooding and seasonal wetness are the major limitations to most nonfarm uses of this soil. Capability unit IIw-2; woodland suitability group 2w3.

Oshtemo Series

The Oshtemo series consists of deep, well drained, gently sloping to very steep soils that formed in loamy and sandy outwash on outwash terraces and kames.

In a representative profile the surface layer is dark brown sandy loam 10 inches thick. The subsoil extends to a depth of 48 inches; it is yellowish brown and brown friable sandy loam. The substratum to a depth of 60 inches is pale brown sand.

Oshtemo soils have a deep root zone and a low available water capacity. Permeability is moderately rapid in the subsoil and rapid in the underlying sand. These soils warm up and dry out early in spring.

Oshtemo soils are about equally used for cultivated crops and woodland. Some cleared areas are no longer cultivated. Where these soils are cultivated, the main crops are corn, wheat, and grass-legume meadow.

Representative profile of Oshtemo sandy loam, 2 to 6 percent slopes, in Shalersville Township, 4 miles northwest of Ravenna, 790 feet south of Webb Road, and 1,000 feet east of Price Road:

Ap—0 to 10 inches; dark brown (10YR 4/3) sandy loam; weak medium granular structure; very friable; 2 to 5 percent gravel; medium acid; abrupt smooth boundary.

B1—10 to 23 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; friable; about 2 to 5 percent gravel; medium acid; clear wavy boundary.

B2t—23 to 35 inches; brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; thin patchy clay films bridging sand grains; 2 to 5 percent gravel; medium acid; gradual wavy boundary.

B3—35 to 48 inches; brown (7.5YR 4/4) sandy loam; massive; friable; few fine very dark grayish brown (10YR 3/2) stains; about 5 percent gravel; medium acid; gradual wavy boundary.

C—48 to 60 inches; pale brown (10YR 6/3) sand; single grained; loose; medium acid.

The solum is 40 to 55 inches thick. The B horizon is medium acid to strongly acid, and the C horizon is slightly acid to strongly acid. Content of coarse fragments in the solum ranges from 1 to 30 percent.

The Ap horizon is dark brown (10YR 4/3) and dark grayish brown (10YR 4/2). The A1 horizon, in undisturbed areas, is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3) and is 1 to 4 inches thick. If there is an A2 horizon, it is brown (10YR 5/3) or yellowish brown (10YR 5/4). The Bt horizon has a hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam, gravelly sandy loam, and sandy clay loam. In the lower part of the solum, in some profiles, the Bt horizon is in layers ⅛ to 4 inches thick that are separated by loamy sand.

Oshtemo soils are commonly near Chili and Lakin soils. They are similar to Chili soils, but have less gravel and clay in the B horizon. Oshtemo soils are similar to Lakin soils, but have less sand and lack banding in the B horizon.

OsB—Oshtemo sandy loam, 2 to 6 percent slopes. This is a gently sloping soil on short terraces. Areas are irregular in shape. This soil has the profile described as representative of the series.

Included with this soil in mapping are a few spots of the more gravelly Chili soils and a few areas of soils that have slopes of less than 2 percent. Reaction is more acid than is typical of the series in the lower part of the subsoil and in the underlying material in some places.

Runoff is slow, but the hazard of erosion is moderate if this soil is cultivated. This soil is droughty, and there is often insufficient moisture for cultivated crops. Slope is the major limitation of this soil for some nonfarm uses. Capability unit IIIs-1; woodland suitability group 3s1.

OsC—Oshtemo sandy loam, 6 to 12 percent slopes. This is a gently sloping soil on rolling kames and terrace breaks. The areas are mostly less than 10 acres in size and are irregular in shape. Slopes are generally short.

Included with this soil in mapping are small areas of the adjacent Chili soils. Also included are areas where the surface layer is sandier or where reaction is more acid throughout than is described as representative of the series.

Runoff is medium, and the hazard of erosion is severe if this soil is cultivated. This soil is droughty in

summer. Slope is the major limitation for many nonfarm uses. Capability unit IIIe–3; woodland suitability group 3s1.

Ravenna Series

The Ravenna series consists of deep, nearly level to gently sloping, somewhat poorly drained soils that have a fragipan. These soils formed in loam or silt loam glacial till. They are on the uplands in the southwestern and north-central parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The upper part of the subsoil, between depths of 8 and 27 inches, is mottled brown and dark yellowish brown silt loam and loam. Between depths of 27 and 41 inches, it is a dense, very firm, dark brown loam fragipan. The lower part of the subsoil and the substratum to a depth of 60 inches are dark brown and brown loam.

Ravenna soils have a moderately deep root zone and a moderate available water capacity. Permeability is moderate above the fragipan and slow in the fragipan. These soils have a perched water table above the fragipan in winter and in spring.

Most areas of these soils are cultivated, but some are in pasture or are wooded. The principal crops are corn, wheat, and grass-legume meadow. Crop yields are improved by artificial drainage.

Representative profile of Ravenna silt loam, 2 to 6 percent slopes, in Charleston Township, 3½ miles northeast of Ravenna in the Ravenna Arsenal, 1,900 feet east of Berry Road, and 1,650 feet north of the intersection of Garrett and McCormick Roads:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; 3 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B1—8 to 12 inches; brown (10YR 5/3) silt loam; many medium distinct light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; firm; light brownish gray (2.5Y 6/2) ped faces; thin very patchy films on some pores; 3 percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—12 to 20 inches; brown (10YR 5/3) heavy loam; many medium distinct grayish brown (2.5Y 5/2) mottles; moderate coarse subangular blocky structure; firm; ped faces coated with grayish brown (2.5Y 5/2); patchy thin clay films on ped faces; 4 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—20 to 27 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure parting to weak thick platy; firm; grayish brown (2.5Y 5/2) vertical ped faces; thin patchy clay films on vertical ped faces and in ped interiors; 4 percent coarse fragments; very strongly acid; clear smooth boundary.

Bx—27 to 41 inches; dark brown (10YR 4/3) loam; weak very coarse prismatic structure parting to weak medium platy; very firm, brittle; light brownish gray (2.5Y 6/2) vertical ped faces; medium patchy grayish brown (2.5Y 5/2) clay films mainly on vertical ped faces; common very dark brown (10YR 2/2) stains in ped interiors; 5 percent coarse fragments; very strongly acid; gradual smooth boundary.

B3—41 to 52 inches; dark brown (10YR 4/3) loam; weak very coarse prismatic structure parting to weak medium platy; firm; 5 percent coarse fragments; few very dark brown (10YR 2/2) stains in ped interiors; very strongly acid; gradual smooth boundary.

C—52 to 60 inches; brown (10YR 4/3) loam; massive; firm; 8 percent coarse fragments; medium acid.

The solum is 40 to 60 inches thick. It is typically medium acid or strongly acid, but ranges to very strongly acid except where the soil has been limed.

In uncultivated areas the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) and is 2 to 5 inches thick. Where there is an A2 horizon, it is dark yellowish brown (10YR 4/4) or brown (10YR 5/3) and is 3 to 6 inches thick. The Ap horizon is dark grayish brown (10YR 4/2 or 2.5Y 4/2).

The Bt horizon above the fragipan typically is loam or silt loam, but in places has thin subhorizons of clay loam. It has a hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3, 4, or 5. Ped faces are dominantly light brownish gray (2.5Y 6/2) to gray (5Y 5/1, 5Y, 6/1) or dark gray (5Y 4/1).

The Bx horizon has a hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Prism surfaces have coatings of gray (10YR 5/1, 6/1, 5Y 5/1), light brownish gray (2.5 6/2), or dark gray (10YR 4/1). Texture is loam or silt loam. The C horizon is loam or silt loam.

Ravenna soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Wooster soils, the moderately well drained Canfield soils, and the poorly drained Frenchtown soils. They are commonly adjacent to these soils and to Sebring, Fitchville, and Wadsworth soils. Ravenna soils have a fragipan, whereas Sebring and Fitchville soils do not. They have less clay in the B and C horizons than Wadsworth soils.

ReA—Ravenna silt loam, 0 to 2 percent slopes. This is a nearly level soil on upland flats. Areas of this soil are variable in size. Included in mapping are small spots of the poorly drained Frenchtown soils, particularly in shallow drainageways and in depressions.

Runoff is slow, and water from surrounding higher areas accumulates on this soil. Seasonal wetness is a moderate limitation to the use of this soil for cultivated crops. The surface layer is subject to crusting. Seasonal wetness and slow permeability are the major limitations for many nonfarm uses. Capability unit IIw–3; woodland suitability group 2w3.

ReB—Ravenna silt loam, 2 to 6 percent slopes. This is a gently sloping soil on areas near the heads of drainageways or on long upland slopes. Areas of this soil are variable in size and range from 2 to 50 acres. This soil has the profile described as representative of the series. Included in mapping are better drained Canfield soils on small knolls.

Runoff is medium. There is a lateral movement of water downslope on top of the fragipan on long slopes. This results in downslope seeps during periods of heavy rainfall. Seasonal wetness is a moderate limitation to the use of this soil for cultivated crops. This soil is subject to surface crusting. Because runoff is medium, erosion is a hazard. Seasonal wetness and slow permeability are the major limitations to the nonfarm use of this soil. Capability unit IIw–3; woodland suitability group 2w3.

Remsen Series

The Remsen series consists of deep, somewhat poorly drained, nearly level to gently sloping soils that formed in silty clay glacial till. These soils are on uplands mainly in the southeastern part of the county.

In a representative profile the surface layer is dark grayish brown and brown silt loam 11 inches thick.

The subsoil extends to a depth of 40 inches; it is mainly mottled yellowish brown silty clay in which the natural aggregates have grayish surfaces. The substratum to a depth of 60 inches is light olive brown silty clay.

The Remsen soils have a moderately deep root zone and a moderate available water capacity. Permeability is very slow in the subsoil and substratum. These soils have a seasonal high water table, and they are slow to dry out in spring.

Most areas have been cleared but are not farmed. Some areas are used as woodland or pasture.

Representative profile of Remsen silt loam, 0 to 2 percent slopes, in Deerfield Township, 2½ miles southwest of Deerfield, 5,700 feet north of Stark County line, 5,020 feet east of State Route 225, and 1,000 feet south of Fewtown Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; less than 2 percent coarse fragments; neutral; abrupt smooth boundary.

A2—7 to 11 inches; brown (10YR 5/3) silt loam; common fine distinct light brownish gray (2.5Y 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; less than 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B&A—11 to 14 inches; yellowish brown (10YR 5/4) heavy silty clay loam; common medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; firm; light brownish gray (2.5Y 6/2) ped faces; common medium light gray (10YR 7/2) silty coatings on ped faces; about 3 percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—14 to 21 inches; yellowish brown (10YR 5/4) silty clay; common medium prismatic structure parting to moderate medium angular blocky; firm; light brownish gray (2.5Y 6/2) ped faces; thin patchy clay films on ped faces; less than 2 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—21 to 32 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; grayish brown (2.5Y 5/2) ped faces; thin patchy clay films on ped faces; common fine black (10YR 2/1) stains on ped interiors; about 2 percent coarse fragments; slightly acid; gradual smooth boundary.

B3—32 to 40 inches; yellowish brown (10YR 5/4) silty clay; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; grayish brown (2.5Y 5/2) vertical ped faces; thin patchy clay films on vertical ped faces; few very dark brown (10YR 2/2) stains in ped interiors; about 2 percent coarse fragments; neutral; abrupt wavy boundary.

C—40 to 60 inches; light olive brown (2.5Y 5/4) silty clay; weak thick platy structure; firm; few white (10YR 8/2) calcium carbonate segregations; few grayish brown (2.5Y 5/2) coatings on vertical fracture surfaces; about 5 percent coarse fragments; mildly alkaline; calcareous.

The solum is 36 to 48 inches thick. It is very strongly acid in the upper part and grades to slightly acid or neutral in the lower part in unlimed areas. The C horizon is mainly mildly alkaline. Depth to calcareous material is 28 to 46 inches.

In undisturbed areas, the A1 horizon is 1 to 2 inches thick. The Ap horizon is dark grayish brown (10YR 4/2, 2.5Y 4/2) or dark gray (10YR 4/1). There is an A2 horizon in some profiles. The B2 horizon is yellowish brown (10YR 5/4, 5/6) and olive brown (2.5Y 4/4), and the ped faces are grayish brown (10YR 5/2, 2.5Y 5/2), gray (10YR 5/1), dark gray (10YR 4/1), and light brownish gray (10YR 6/2).

Remsen soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained Geeburg soils and the poorly drained Trumbull soils. Remsen soils are commonly adjacent to Fitchville and Mahoning soils. They have more clay in the B horizon than Fitchville and Mahoning soils. Remsen soils are similar to Caneadea soils, but they have more coarse fragments and lack stratified material in the C horizon.

RmA—Remsen silt loam, 0 to 2 percent slopes. This is a nearly level soil generally on low rises on undulating till plains. Most areas are oval in shape and vary in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small spots of the poorly drained Trumbull soils, particularly in shallow drainageways and in depressions. Also included in some areas are soils that are silt loam to a depth of as much as 24 inches.

Runoff is slow to ponded, and seasonal wetness is a severe limitation if this soil is cultivated. Seasonal wetness, a high shrink-swell potential, and slow permeability are limitations for many nonfarm uses. Capability unit IIIw-4; woodland suitability group 2w3.

RmB—Remsen silt loam, 2 to 6 percent slopes. This is a gently sloping soil in convex upland areas. Many areas of this soil are broad and range to about 1,000 acres in size. Typically slopes are long and irregular in shape, and they are mainly less than 5 percent.

Included in mapping are a few moderately eroded spots, small spots of the better drained Geeburg soils, particularly in areas where the slope is 4 to 6 percent, and some areas where the soils are silt loam or silty clay loam to a depth of 24 inches.

Runoff is medium to rapid. On some long slopes there is an internal lateral movement of water that tends to pond in low spots. Seasonal wetness and erosion are limitations to the use of this soil for cultivated crops. Seasonal wetness, a high shrink-swell potential, and slow permeability are limitations for many nonfarm uses. Capability unit IIIw-4; woodland suitability group 2w3.

Rittman Series

The Rittman series consists of deep, moderately well drained, gently sloping to steep soils that formed in clay loam and silty clay loam glacial till.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. The subsoil is yellowish brown silt loam, yellowish brown clay loam, brown clay loam, and dark yellowish brown clay loam to a depth of 26 inches. Between depths of 26 and 47 inches it is a dark yellowish brown, very firm, compact clay loam fragipan. The lower part of the subsoil and the substratum to a depth of 70 inches are dark yellowish brown clay loam.

Rittman soils have a moderately deep root zone and a moderate available water capacity. Permeability is slow in and below the fragipan. These soils have a perched water table within 2 feet of the surface during wet periods, generally in winter and early in spring.

Most areas have been cleared of trees and were once

farmed, but they are now idle. In cultivated areas, the main crops are grass-legume meadow, wheat, and corn.

Representative profile of Rittman silt loam, 2 to 6 percent slopes, in Atwater Township, 1¼ miles south and ½ mile east of Atwater Center, 510 feet north of Virginia Road (Profile PG–2 in the section "Laboratory Data"):

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

B&A—9 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; few dark grayish brown (10YR 4/2) earthworm channels; thin continuous light yellowish brown (10YR 6/4) silt coatings on ped faces when dry; thin very patchy brown (10YR 5/3) clay films on ped faces; medium acid; clear smooth boundary.

B21t—14 to 19 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) and few fine distinct gray (5Y 6/1) mottles; moderate fine and medium subangular blocky structure; friable; thin continuous pale brown (10YR 6/3) silt coatings and thin patchy brown (10YR 5/3) clay films on ped faces; about 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—19 to 22 inches; brown (7.5YR 4/4) clay loam; moderate fine and medium subangular blocky structure; firm; continuous light brownish gray (10YR 6/2) coatings, thin patchy gray (5Y 6/1) silt coatings, and thin patchy brown (10YR 4/3) clay films on ped faces; about 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B23t—22 to 26 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium and coarse prismatic structure parting to weak medium subangular blocky; very firm, brittle in half the volume; medium continuous gray (5Y 5/1) clay films on vertical ped faces; thin patchy dark yellowish brown (10YR 4/4) clay films in voids; about 5 percent coarse fragments; very strongly acid; gradual smooth boundary.

Bx1—26 to 35 inches; dark yellowish brown (10YR 4/4) clay loam; moderate very coarse prismatic structure parting to weak thick platy; very firm, 80 to 90 percent brittle; thick continuous gray (5Y 5/1) clay films on vertical ped faces underlain by a yellowish red (5YR 5/6) zone 1 to 2 millimeters thick; common very dark brown (10YR 2/2) stains on horizontal surfaces and in matrix; about 5 percent coarse fragments; very strongly acid; gradual smooth boundary.

Bx2—35 to 47 inches; dark yellowish brown (10YR 4/4) clay loam; weak very coarse prismatic structure parting to weak thick platy; very firm, about 90 percent brittle; thin and medium continuous gray (5Y 5/1) clay films on vertical ped faces; common very dark brown (10YR 2/2) stains on horizontal faces and in matrix; about 5 percent coarse fragments; medium acid; gradual smooth boundary.

B3—47 to 55 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse prismatic structure parting to weak thick platy; firm, few spots are brittle; thin continuous gray (5Y 5/1) clay films on some vertical ped faces; very dark brown (10YR 2/2) stains on horizontal ped faces; about 5 percent coarse fragments; slightly acid; gradual smooth boundary.

C—55 to 70 inches; dark yellowish brown (10YR 4/4) clay loam; moderate thick platy structure; firm; few gray (5Y 5/1) vertical seams; about 5 percent coarse fragments; mildly alkaline; calcareous.

The solum is 40 to 60 inches thick. It is very strongly acid to strongly acid above the fragipan and less acid as depth increases. Content of coarse fragments ranges from 0 to 10 percent above the fragipan and from 2 to 15 percent in the fragipan and the C horizon. Depth to calcareous material is 40 to 60 inches.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). In undisturbed areas the A1 horizon is very dark grayish brown (10YR 3/2) and is 1 to 3 inches thick, and the A2 horizon is brown (10YR 5/3) and is 4 to 7 inches thick. Evidence of degradation is common on ped faces in the B1 and B&A horizons.

The Bt horizon is clay loam or silty clay loam above the fragipan. It has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3, 4, or 5. The Bx horizon is dark brown (10YR 4/3) or dark yellowish brown (10YR 4/4) light clay loam or silty clay loam. Black (10YR 2/1) or very dark brown (10YR 2/2) stains are common in the matrix.

The C horizon is loam, silt loam, clay loam, or silty clay loam. Coarse fragments as much as 3 inches in diameter are common.

Rittman soils are the moderately well drained member of a drainage sequence that includes the somewhat poorly drained Wadsworth soils and the poorly drained Frenchtown soils. Rittman soils are commonly adjacent to Wadsworth, Ellsworth, Canfield, and Glenford soils.

Rittman soils have less clay in the B horizon and in the underlying glacial till than Ellsworth soils. They also have a fragipan that is absent in the Ellsworth soils. Rittman soils have more sand and coarse fragments and less silt than Glenford soils. They also have a fragipan that is lacking in Glenford soils. Rittman soils have more clay in the Bt and Bx horizons than Canfield soils.

RsB—Rittman silt loam, 2 to 6 percent slopes. This is a gently sloping soil on knolls and side slopes along drainageways. It has the profile described as representative of the series. Most areas of this soil range from 10 to 100 acres in size. Included in mapping are small areas of Canfield soils and small areas of the somewhat poorly drained Wadsworth soils, particularly in less sloping areas where water from surrounding soils accumulates. Near the top of slopes in some areas are small moderately eroded spots.

Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Surface crusting is a problem in cultivated areas. Slow permeability and seasonal wetness are limitations to some nonfarm uses of this soil. Capability unit IIe–2; woodland suitability group 1o1.

RsC—Rittman silt loam, 6 to 12 percent slopes. This is a sloping soil mainly along drainageways in wooded areas. Included in mapping are spots of the somewhat poorly drained Wadsworth soils, mainly in seep areas.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. Surface crusting is a limitation in cultivated areas. Slow permeability, seasonal wetness, and slope are limitations to many nonfarm uses of this soil. Capability unit IIIe–2; woodland suitability group 1o1.

RsC2—Rittman silt loam, 6 to 12 percent slopes, moderately eroded. This soil is on hillsides along drainageways and on moraines on the uplands. The surface layer is a mixture of yellowish brown material from the subsoil and the remaining original surface soil. Depth to the fragipan is commonly less than 18 inches, and gray mottles are common between depths of 10 and 20 inches. Because of erosion, the surface layer is low in content of organic matter. This soil has a thinner root zone and lower available water capacity than uneroded Rittman soils.

Included in mapping are small areas where the surface layer is mainly yellowish brown subsoil material that contains common coarse fragments as much as 2 inches in diameter. These areas typically have shal-

low gullies. Wet spots are in some shallow drainageways crossing this soil. Also included are small areas of Canfield soils.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. Surface crusting is a serious problem in cultivated areas. Slow permeability, seasonal wetness, and slope are limitations for many nonfarm uses. Capability unit IIIe–2; woodland suitability group 1o1.

RsD2—Rittman silt loam, 12 to 18 percent slopes, moderately eroded. This is a moderately steep soil on irregular hillsides that commonly have shallow drainageways. In most areas more than half of the original surface layer has been lost through erosion. Erosion has reduced the available water capacity and the depth of the root zone of this soil.

Included with this soil in mapping are a few eroded spots where the surface layer is mostly yellowish brown subsoil material. Also included are a few uneroded areas that are mainly wooded.

Runoff is rapid, and the hazard of erosion is severe if this soil is cultivated. Slope and slow permeability are limitations for most nonfarm uses. Capability unit IVe–4; woodland suitability group 1r1.

RsE2—Rittman silt loam, 18 to 25 percent slopes, moderately eroded. This is a steep soil on valley side slopes and on upland areas that have a pronounced irregular, hilly topography. It has a profile similar to the one described as representative of the series, except that the fragipan is not as pronounced. The surface layer is a mixture of the original surface layer and yellowish brown subsoil material.

Included with this soil in mapping are some well drained soils that have a browner subsoil. Also included are soils in areas that are only slightly eroded and that are mostly wooded.

Runoff is very rapid as a result of the steep slopes, and the hazard of erosion is very severe unless a thick plant cover is maintained. Slope is the major limitation to most nonfarm uses of this soil. Capability unit VIe–1; woodland suitability group 1r1.

Sebring Series

The Sebring series consists of deep, poorly drained, nearly level soils that formed in silty sediments. These soils are on stream terraces throughout the county.

In a representative profile the surface layer is dark gray silt loam 9 inches thick. The subsoil extends to a depth of 50 inches. It is mottled gray silt loam to a depth of 16 inches, and below that it is mottled gray and yellowish brown silty clay loam. The substratum to a depth of 60 inches is mottled yellowish brown silt loam.

Sebring soils have a deep root zone in summer when the water table is low and in drained areas. The available water capacity is high, and permeability is moderately slow. These soils are soft and compressible if saturated.

About half the acreage of Sebring soils has been cleared of trees, but most cleared areas are not farmed. Few areas are cultivated because of the lack of adequate artificial drainage.

Representative profile of Sebring silt loam in Shalersville Township, 3⅓ miles north of Ravenna, 4,400 feet south of Webb Road, and 100 feet west of State Route 44:

Ap—0 to 9 inches; dark gray (10YR 4/1) silt loam; few common distinct yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

B1g—9 to 16 inches; gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; thin continuous light gray (10YR 6/1) silty coatings on ped faces; strongly acid; clear smooth boundary.

B21gt—16 to 25 inches; gray (10YR 5/1) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; light gray (10YR 6/1) ped faces; thin very patchy clay films on ped faces; strongly acid; clear smooth boundary.

B22gt—25 to 34 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; light gray (10YR 6/1) ped faces; thin patchy clay films on ped faces; medium acid; clear smooth boundary.

B3—34 to 50 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 5/1) and brown (7.5YR 4/4) mottles; weak coarse prismatic structure; firm; gray (N 5/0) ped faces; medium very patchy clay films mainly on vertical ped faces; neutral; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 5/1) mottles; massive; friable; few vertical seams of gray (10YR 5/1); neutral.

The solum is 35 to 50 inches thick. The Bt horizon commonly ends above a depth of 40 inches. Reaction is very strongly acid to medium acid in the A horizon and the upper part of the B horizon and is medium acid to neutral in the lower part of the B horizon.

The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2). In uncultivated areas the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) and is 3 to 4 inches thick; and the A2 horizon is gray (10YR 5/1, 6/1) or dark grayish brown (10YR 4/2) and is 3 to 6 inches thick.

The B2tg horizon has a hue of 10YR through 5Y, value of 4 or 5, and chroma of 0 to 1. It is silt loam or silty clay loam, but there are thin strata of loam or clay loam in the Bt horizon in some profiles.

Sebring soils are the poorly drained member of a drainage sequence that includes the moderately well drained Glenford soils, the somewhat poorly drained Fitchville soils, and the very poorly drained Sebring variant. Sebring soils are commonly adjacent to these soils and to Damascus, Canadice, Caneadea, Ravenna, Trumbull, and Frenchtown soils. They have less clay in the B horizon than Canadice, Caneadea, and Trumbull soils. They have more silt and less sand in the Bt and C horizons than Damascus soils and lack the fragipan characteristic of Frenchtown and Ravenna soils.

Sb—Sebring silt loam. This is a nearly level soil on broad, low, level terraces. Most areas of this soil are 5 to 50 acres in size.

Included with this soil in mapping are small spots of the very poorly drained Sebring variant, particularly in shallow depressions. This soil is commonly next to Damascus soils, small areas of which are also included. In some places, the subsoil between depths of 15 and 30 inches is less gray and more brown than is described as representative of the series.

Runoff is slow to ponded, and the surface layer is susceptible to crusting. Seasonal wetness and poor natural drainage are severe limitations to the use of this soil for cultivated crops. Moderately slow permeability,

seasonal wetness, and low bearing strength are limitations for many nonfarm uses. Capability unit IIIw-3; woodland suitability group 2w2.

Sebring Variant

The Sebring variant consists of deep, very poorly drained, nearly level soils that formed in lacustrine sediments. These soils are in old glacial lakebeds and in small depressions on uplands throughout the county.

In a representative profile the surface layer is very dark gray silt loam 8 inches thick. The subsoil, between depths of 8 and 21 inches, is firm, grayish brown and dark gray silt loam, and between depths of 21 and 42 inches it is dark gray and gray silty clay loam. The substratum to a depth of 60 inches is light brownish gray and very dark grayish brown stratified loamy sand, silty clay loam, and silt loam.

Sebring variant soils have a deep root zone in summer when the water table is low and in drained areas. These soils have a high available water capacity. Permeability is moderately slow in the subsoil and substratum.

Most areas have been cleared of trees but are no longer cultivated. Most areas lack adequate artificial drainage for good crop production.

Representative profile of Sebring silt loam, dark surface variant, in Brimfield Township, 150 feet west of Sunnybrook Road, 4,000 feet north of Old Forge Road:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam; moderate coarse granular structure; friable; neutral; abrupt smooth boundary.

B1g—8 to 14 inches; grayish brown (2.5Y 5/2) silt loam; common fine and medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse subangular blocky structure; firm; dark gray (10YR 4/1) vertical ped faces; thin very patchy clay films on vertical ped faces; few fine concretions; neutral; gradual smooth boundary.

B21tg—14 to 21 inches; dark gray (5Y 4/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse angular blocky structure; friable; thin dark gray (5Y 4/1) patchy clay films on ped faces; common fine concretions; slightly acid; gradual smooth boundary.

B22tg—21 to 32 inches; gray (5Y 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; thin patchy gray (5Y 5/1) clay films on ped faces; few dark gray (10YR 4/1) coatings in root channels; slightly acid; gradual smooth boundary.

B23tg—32 to 42 inches; dark gray (5Y 4/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin very patchy dark gray (5Y 4/1) clay films mainly on vertical ped faces; few very dark gray (N 3/0) organic coatings in root channels; few fine concretions; slightly acid; clear smooth boundary.

IIC1—42 to 47 inches; light brownish gray (2.5Y 6/2) loamy sand; common coarse faint light olive brown (2.5Y 5/4) mottles; single grained; friable; slightly acid; clear smooth boundary.

IIIC2—47 to 56 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silty clay loam; massive; firm; slightly acid; clear smooth boundary.

IIIC3—56 to 60 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam; massive; friable; neutral.

The solum is 35 to 50 inches thick. It is medium acid to neutral.

The A horizon is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) and is 7 to 10 inches thick. The B horizon has a hue of 10YR, 2.5Y, 5Y, or is neutral; value of 4 or 5; and chroma of 0, 1, or 2. It is silt loam to silty clay loam.

Sebring variant soils are the very poorly drained member of a drainage sequence that includes the moderately well drained Glenford soils, the somewhat poorly drained Fitchville soils, and the poorly drained Sebring soils. Sebring variant soils are commonly adjacent to Lorain and Sebring soils. They have less clay than Lorain soils and have a darker A horizon than Sebring soils.

Sv—Sebring silt loam, dark surface variant. This is a nearly level soil in areas generally more than 10 acres in size. It is roughly circular in shape.

Included with this soil in mapping are a few small areas that have a surface layer of silty clay loam. These included areas are more sticky and difficult to till. Wetness is a severe limitation to the use of this soil for cultivated crops. Wetness, moderately slow permeability, and poor stability are limitations for many nonfarm uses. Capability unit IIw-5; woodland suitability group 2w1.

Tioga Series

The Tioga series consists of deep, well drained, nearly level soils that formed in alluvium. These soils are on flood plains throughout the county.

In a representative profile the surface layer is brown loam 10 inches thick. The subsoil extends to a depth of 26 inches; it is dark yellowish brown fine sandy loam. The substratum to a depth of 60 inches is dark yellowish brown fine sandy loam.

Tioga soils are subject to flooding. They have a deep root zone and a moderate available water capacity. Permeability is moderate to moderately rapid.

Many areas have been cleared of trees, but few areas are cultivated. Some areas are wooded.

Representative profile of Tioga loam, in Paris Township, 500 feet south of the Village of Wayland, 100 feet north of the West Branch of the Mahoning River, and 200 feet west of Wayland Road:

Ap—0 to 10 inches; brown (10YR 4/3) loam; moderate medium granular structure; friable; dark brown (10YR 3/3) coatings; slightly acid; gradual wavy boundary.

B—10 to 26 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; brown (10YR 4/3) ped faces; medium acid; gradual wavy boundary.

C—26 to 60 inches; dark yellowish brown (10YR 4/4) fine sandy loam; massive; medium acid.

The solum is 18 to 30 inches thick. Reaction is strongly acid to medium acid to a depth of 40 inches, except where the soil has been limed. The A horizon is loam, fine sandy loam, and silt loam. The B horizon is dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), and brown (7.5YR 4/4) fine sandy loam, sandy loam, and loam.

Tioga soils are the well drained member of a drainage sequence that includes the somewhat poorly drained Orrville soils and the poorly drained Holly soils. Tioga soils lack the gray colors and gray mottles in the B horizon characteristic of those soils.

Tg—Tioga loam. This is a nearly level soil mainly on narrow flood plains. It is loamy and generally has good tilth. Most areas of this soil are dissected by stream meander channels. Included in mapping are spots of the wetter Orrville soils in low areas and areas where the surface layer is silt loam or sandy loam.

The hazard of flooding is moderate if this soil is cultivated. It is the major limitation for most nonfarm uses. Capability unit IIw-1; woodland suitability group 1o1.

Trumbull Series

The Trumbull series consists of deep, poorly drained, nearly level soils. These soils formed in silty clay loam, clay loam, or silty clay glacial till.

In a representative profile the surface layer is dark gray silt loam 8 inches thick. The subsoil between depths of 8 and 13 inches is mottled dark gray silty clay loam, and between depths of 13 and 42 inches, it is mottled dark gray, gray, and yellowish brown silty clay. The substratum to a depth of 67 inches is mottled olive brown silty clay.

Trumbull soils have a moderately deep root zone and a moderate available water capacity. Permeability is very slow in the subsoil and underlying glacial till. These soils are saturated with water for long periods in winter, spring, and early in summer. Runoff is slow, and ponding is common after heavy rains. Trumbull soils are slow to dry out in spring unless they are artificially drained.

Most areas have been cleared of trees, but lack adequate drainage for cultivated crops. Drainage is necessary for the production of most crops.

Representative profile of Trumbull silt loam, 0 to 2 percent slopes, in Deerfield Township, 3¼ miles southwest of Deerfield, 5,000 feet north of Stark County line, 1,700 feet south of Fewtown Road, and 700 feet east of State Route 225:

Ap—0 to 8 inches; dark gray (10YR 4/1) heavy silt loam; weak fine subangular blocky structure; friable; about 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1g—8 to 13 inches; dark gray (10YR 4/1) heavy silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium angular blocky structure; firm; grayish brown (2.5Y 5/2) ped faces; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B21tg—13 to 19 inches; dark gray (10YR 4/1) silty clay; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; thin patchy dark gray (10YR 4/1) clay films on ped faces; 2 percent coarse fragments; very strongly acid; clear wavy boundary.

B22tg—19 to 32 inches; gray (5Y 5/1) silty clay; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak coarse angular blocky; firm; thin patchy gray (N 5/0) clay films on ped faces; 2 percent coarse fragments; slightly acid; gradual wavy boundary.

B3—32 to 42 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct gray (N 5/0) mottles; massive; firm; 3 percent coarse fragments; mildly alkaline; clear wavy boundary.

C—42 to 67 inches; olive brown (2.5Y 4/4) silty clay; common fine distinct gray (N 5/0) mottles; massive; firm; 4 percent coarse fragments; mildly alkaline; calcareous.

The solum is 40 to 60 inches thick. Content of coarse fragments is dominently 2 to 5 percent, but it ranges to 10 percent. Reaction is medium acid to very strongly acid in the upper part of the solum and slightly acid to mildly alkaline in the lower part unless the soil has been limed.

The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2, 2.5Y 4/2). In wooded areas, the A1 horizon is brown (10YR 3/2) and is 1 to 4 inches thick, and the A2 horizon is gray (10YR 5/1 or N 5/0) or dark gray (10YR 3/1 or N 4/0) and is 3 to 9 inches thick. The B horizon, to a depth of 30 inches, is neutral or has a hue of 10YR to 5Y, value of 4 or 5, and chroma of 0, 1, or 2. It is dominantly silty clay or clay, but has thin layers of heavy silty clay loam. The C horizon is clay loam, silty clay loam, or silty clay.

Trumbull soils are the poorly drained member of a drainage sequence that includes the moderately well drained Ellsworth and Geeburg soils and the somewhat poorly drained Mahoning and Remsen soils. Canadice and Sebring soils commonly are on similar positions to those occupied by Trumbull soils. They have some coarse fragments and lack the stratified C horizon characteristic of Canadice soils. They have more clay and less silt in the B horizon than Sebring soils.

TrA—Trumbull silt loam, 0 to 2 percent slopes. This is a nearly level soil mainly along small drainageways or in small depressions adjacent to the better drained Mahoning and Remsen soils. Most areas of this soil are no more than 10 acres in size.

Included in mapping are small spots of dark colored, very poorly drained soils in drainageways and in depressions and a few areas of soils that have a surface layer of silty clay loam.

Seasonal wetness is the major limitation to the use of this soil for cultivated crops. Seasonal wetness and very slow permeability are limitations for many nonfarm uses. Capability unit IVw-1; woodland suitability group 2w2.

Typic Udorthents

TUB—Typic Udorthents, strip mined, undulating, are areas of spoil material derived from coal and clay mining operations mainly in the southeastern part of the county. This spoil material is derived mainly from acid shale bedrock and also from sandstone and glacial till materials.

This soil material is shaly or very shaly silty clay. It is extremely acid to strongly acid to a depth of 2 feet and is extremely acid to slightly acid below. Some areas are toxic to plants. Most areas have been graded to slopes of 2 to 6 percent. A few areas have slopes of 6 to 12 percent. Most areas have been planted to black locust and other species of trees, but many of these plantings were not successfully established. About half of the areas lack plant cover.

The soil material lacks organic matter, and it has a moderate to low amount of plant nutrients. The available water capacity is variable, but it is mostly low. The surface is commonly littered with shale fragments. The surface layer is dense and has poor tilth. When exposed to rain, the surface tends to seal, reducing infiltration and restricting the emergence and growth of seedlings.

The soil material has severe limitations for most uses. Runoff is rapid, and controlling erosion and gullying are severe problems of management. Most areas can be used as pasture, hayland, or woodland. Water that is suitable for fishing or other recreational uses is present in many mine pits. Not assigned to a capability unit; not assigned to a woodland suitability group.

TUD—Typic Udorthents, strip mined, hilly, are areas of spoil material derived from coal and clay mining operations, mostly in the southeastern part of the

county. This spoil material is mainly derived from acid shale material and some sandstone and glacial till material.

The soil material is shaly or very shaly silty clay. It is extremely acid to very strongly acid. In a few areas it is toxic. In a few areas, where the soil material is mostly glacial till, reaction is neutral to moderately alkaline. Slopes are generally moderately steep but range from 6 to 25 percent. They are mainly hummocky and irregular in shape.

The soil material lacks organic matter and has a low to moderate amount of plant nutrients. The available water capacity is low, and permeability is variable. Runoff is rapid, and the hazard of erosion is very severe unless a cover of plants is maintained. Most areas, except where the soil material is toxic, are suited to woodland and possibly to limited use as pasture or hayland. Some ponded areas are suited to fishing and recreational uses. Not assigned to a capability unit; not assigned to a woodland suitability group.

Urban Land

Ur—Urban land. Urban land consists of areas 10 acres or more in size that are covered by buildings, pavement, or other manmade surfaces. It includes commercial and industrial areas, large factories, shopping centers, warehouses, and railroad yards. Slope ranges from 0 to 25 percent. Most areas have a low infiltration rate and very rapid runoff. These areas significantly increase the volume of water flowing into nearby streams immediately after periods of rainfall. Urban areas can cause siltation of nearby streams unless there is careful management during construction and land reshaping. Not assigned to a capability unit; not assigned to a woodland suitability group.

Wadsworth Series

The Wadsworth series consists of deep, somewhat poorly drained, nearly level to gently sloping soils. These soils formed in silty clay loam and silt loam glacial till on uplands in the northwestern and eastern parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 7 inches thick. The upper part of the subsoil, between depths of 7 and 28 inches, is mostly firm mottled yellowish brown silty clay loam. Between depths of 28 and 50 inches, it is a very firm and brittle, olive brown and light olive brown, silty clay loam fragipan. The lower part of the subsoil and the substratum to a depth of 68 inches are light olive brown and olive brown silty clay loam.

Wadsworth soils have a moderately deep root zone and a moderate available water capacity. Permeability is slow in and below the fragipan. These soils have a perched water table near the surface late in winter, in spring, and early in summer. Artificial drainage is beneficial to cultivated crops.

Most areas are cleared, and a few are in woodland or brush. Most areas that have been cleared are used for corn, wheat, and grass-legume meadow.

Representative profile of Wadsworth silt loam, 2 to 6 percent slopes, in Charlestown Township, 3/8 mile north and 1/4 mile west of Augerburg, 900 feet north of Newton Road, and 4,500 feet east of Barriet Road (Profile PG–S6 in the section "Laboratory Data"):

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; very strongly acid; abrupt smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; grayish brown (2.5Y 5/2) ped faces; 2 percent coarse fragments; very strongly acid; gradual smooth boundary.

B21t—11 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (N 5/0) and reddish yellow (7.5YR 6/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; gray (N 5/0) ped faces; thin patchy gray (N 5/0) clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—18 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) and few medium distinct dark yellowish brown (10YR 4/4) and yellowish red (5YR 5/8) mottles; moderate medium prismatic structure; firm; gray (N 5/0) ped faces; medium continuous gray (N 5/0) clay films on horizontal ped faces; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx1—28 to 40 inches; olive brown (2.5Y 4/4) silty clay loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; medium continuous gray (N 5/0) clay films on vertical ped faces; many very dark brown (10YR 2/2) stains in ped interiors; 5 to 10 percent coarse fragments; medium acid; gradual smooth boundary.

Bx2—40 to 50 inches; light olive brown (2.5Y 5/4) silty clay loam; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; olive gray (5Y 5/2) vertical ped faces; thin gray N 5/0) clay films on vertical ped faces; common very dark brown (10YR 2/2) stains on ped interiors; 5 to 10 percent coarse fragments; neutral; gradual smooth boundary.

B3—50 to 58 inches; light olive brown (2.5Y 5/4) silty clay loam; very weak coarse prismatic structure; firm; 5 to 10 percent coarse fragments; neutral; gradual wavy boundary.

C—58 to 68 inches; olive brown (2.5Y 4/4) silty clay loam; weak thick platy structure; firm; common medium light gray (2.5Y 7/2) lime segregations on horizontal surfaces; 5 to 10 percent coarse fragments; mildly alkaline; calcareous.

The solum is 40 to 60 inches thick. Depth to the fragipan ranges from 24 to 28 inches. Reaction is very strongly acid to strongly acid above the fragipan, strongly acid to medium acid in the upper part of the fragipan, and medium acid to neutral in the lower part of the fragipan and the B3 horizon, except where the soil has been limed. Depth to calcareous material is 50 to 60 inches.

In wooded areas, the A1 horizon is very dark grayish brown (10YR 3/2) and is 1 to 4 inches thick, and the A2 horizon is pale brown (10YR 6/3), brown (10YR 5/3), light brownish gray (10YR 6/2), or grayish brown (10YR 5/2) and is 3 to 4 inches thick. The B2 horizon is yellowish brown (10YR 5/4, 5/6) or dark yellowish brown (10YR 4/4) silty clay loam or clay loam. The interiors of the prisms in the Bx horizon are light olive brown (2.5Y 5/4), olive brown (2.5Y 4/4), and brown (10YR 4/3) light clay loam. The C horizon is mostly silty clay loam or clay loam, but ranges to heavy silt loam and heavy loam.

Wadsworth soils are the somewhat poorly drained member of a drainage sequence that also includes the moderately well drained Rittman soils and the poorly drained Frenchtown soils. Wadsworth soils are commonly adjacent to Mahoning, Fitchville, and Ravenna soils. They have a fragipan, whereas Mahoning and Fitchville soils do not. Wadsworth soils have a slightly higher content of clay in the B and C horizons than Ravenna soils.

WaA—Wadsworth silt loam, 0 to 2 percent slopes. This is a nearly level soil on broad upland flats. Runoff is slow, and the surface layer is highly susceptible to crusting. Included in mapping are small spots of the wetter Frenchtown soils.

The hazard of wetness is moderate if this soil is cultivated. Seasonal wetness and slow permeability are limitations to many nonfarm uses of this soil. Capability unit IIIw-5; woodland suitability group 2w3.

WaB—Wadsworth silt loam, 2 to 6 percent slopes. This is a gently sloping soil near the heads of drainageways and on long gentle upland slopes. It has a profile described as representative of the series. Areas of this soil range from 10 to 100 acres in size.

Included in mapping are small areas of the better drained Rittman soils on knolls and a few spots of the poorly drained Frenchtown soils, particularly along drainageways.

On long slopes there is lateral movement of water downslope along the upper surface of the fragipan. This lateral movement of water frequently results in seepage areas that are slow to dry out in spring. Seasonal wetness is the major limitation to use of this soil for cultivated crops. Erosion is a hazard, particularly on long slopes. Seasonal wetness, slope, and slow permeability are limitations for many nonfarm uses. Capability unit IIIw-5; woodland suitability group 2w3.

Wallkill Series

The Wallkill series consists of deep, very poorly drained, nearly level soils that formed in mineral material and the underlying muck. These soils are in basinlike areas on uplands or along streams.

In a representative profile the surface layer is very dark grayish brown silt loam 2 inches thick. The subsoil, between depths of 2 and 17 inches, is dark grayish silt loam that is mottled below a depth of 10 inches. The layer between depths of 17 and 21 inches is very dark gray silt loam. Below this to a depth of 60 inches is black or dark brown muck.

Wallkill soils have a deep root zone in summer and in drained areas. The available water capacity is high, and permeability is moderate. These soils have a water table at or near the surface in winter, in spring, and early in summer.

Wallkill soils are not extensive in this county. Most areas are cleared of trees but are not cultivated. These areas are used as pasture or are in brush.

Representative profile of Wallkill silt loam, in Rootstown Township, 150 feet east of Johnnycake Road, and about 1,000 feet north of township line:

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; very strongly acid; clear wavy boundary.

B1g—2 to 10 inches; dark grayish brown (2.5Y 4/2) silt loam; weak to moderate medium subangular blocky structure; friable; very dark grayish brown (10YR 3/2) coatings on vertical ped faces; very strongly acid; clear smooth boundary.

B2g—10 to 17 inches; dark grayish brown (10YR 4/2) silt loam; few medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; friable; patchy very dark grayish brown (10YR 3/2) coatings; very strongly acid; clear smooth boundary.

IIAb—17 to 21 inches; very dark gray (10YR 3/1) silt loam; weak coarse prismatic structure; friable; vertical zones of grayish brown (2.5Y 5/2); few fine concretions; very strongly acid; clear smooth boundary.

IIOa1—21 to 30 inches; black (10YR 2/1) broken face and rubbed sapric material; trace of fiber unrubbed and rubbed; friable; vertical seams of grayish brown (2.5Y 5/2) and brown (7.5YR 4/4) mineral material; strongly acid; clear smooth boundary.

IIOa2—30 to 60 inches; dark brown (7.5YR 3/2) sapric material, very dark brown (10YR 2/2) rubbed; 25 to 30 percent fiber, about 5 percent rubbed; massive; medium acid.

The mineral material overlying the organic material is about 16 to 40 inches thick. The organic material is 20 inches thick or more. Where there is a IIAb horizon, it is as much as 10 inches thick. Reaction of the mineral material ranges from very strongly acid to medium acid.

The B horizon is mainly dark grayish brown (10YR 4/2, 2.5Y 4/2) silt loam and silty clay loam. In Portage County the Wallkill soils differ from Wallkill soils mapped elsewhere in that the mineral layer is more acid, but this difference does not alter the use or management of these soils.

Wallkill soils differ from other very poorly drained mineral soils in the county in having buried muck within a depth of 40 inches. They differ from the very poorly drained organic soils in having a mineral overwash that is 20 to 30 inches thick.

Wc—Wallkill silt loam. This is a nearly level soil in closed depressions where surface water is impounded. Most areas are roughly circular in shape and are less than 10 acres in size. Included in mapping are a few areas that are underlain by a dark colored mineral layer rather than by muck.

The hazard of wetness is severe if this soil is cultivated. A high water table and instability are the major limitations for many nonfarm uses. Capability unit IIIw-1; woodland suitability group 2w1.

Wheeling Series

The Wheeling series consists of deep, well drained, nearly level to gently sloping soils that formed in silty material overlying gravel and sand. These soils are on outwash terraces, mainly in the southwestern part of the county.

In a representative profile the surface layer is dark grayish brown silt loam 10 inches thick. The subsoil extends to a depth of 39 inches. It is friable brown and dark brown silt loam and silty clay loam in the upper 20 inches, and it is brown and dark brown sandy clay loam and gravelly sandy clay loam in the lower 9 inches. The substratum to a depth of 70 inches is stratified gravel and sand.

Wheeling soils have a deep root zone and a moderate available water capacity. Permeability is moderate in the subsoil and rapid in the underlying sand and gravel. These soils warm up and dry out early in spring. The material below a depth of 6 feet is a potential source of sand and gravel.

Most areas of Wheeling soils are used for such cultivated crops as corn, wheat, and grass-legume meadow.

Representative profile of Wheeling silt loam, 0 to 2 percent slopes, in Suffield Township, 2¼ miles west-southwest of the town of Suffield, 400 feet east-southeast of Martin Road, 1,580 feet north of Bolender Road (Profile PG-8 in section "Laboratory Data"):

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt

loam; moderate fine and medium granular structure; friable; about 2 percent gravel; medium acid; abrupt smooth boundary.

B1—10 to 16 inches; brown (7.5YR 5/4) silt loam; moderate fine subangular blocky structure; friable; continuous dark grayish brown (10YR 4/2) organic coatings; thin very patchy clay films on ped faces; about 3 percent gravel; medium acid; clear smooth boundary.

B21t—16 to 21 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; patchy dark brown (7.5YR 4/2) organic coatings; thin patchy clay films on ped faces; about 2 percent gravel; strongly acid; clear smooth boundary.

B22t—21 to 30 inches; dark brown (7.5YR 4/4) heavy silt loam; moderate medium subangular blocky structure; friable; thin patchy clay films on ped faces; about 5 percent gravel; very strongly acid; clear smooth boundary.

IIB23t—30 to 33 inches; brown (7.5YR 4/4) sandy clay loam; few fine distinct brown (10YR 5/3) mottles that have strong brown (7.5YR 5/6) outer edges; weak medium subangular blocky structure; friable; thin patchy clay films on ped faces and interiors; about 10 percent gravel; very strongly acid; clear smooth boundary.

IIB24t—33 to 39 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; few medium distinct brown (10YR 5/3) mottles; weak medium and coarse subangular blocky structure; friable; thin patchy clay films bridging sand grains and coating gravel; about 30 percent gravel; very strongly acid; clear wavy boundary.

IIC1—39 to 48 inches; dark brown (7.5YR 4/4) very gravelly coarse sandy loam; single grained; friable; about 50 percent gravel; strongly acid; gradual smooth boundary.

IIC2—48 to 59 inches; dark brown (7.5YR 4/4) very gravelly loamy coarse sand; single grained; loose; about 50 percent gravel; strongly acid; gradual wavy boundary.

IIC3—59 to 70 inches; dark yellowish brown (10YR 4/4) very gravelly loamy coarse sand; single grained; loose; about 60 percent gravel; slightly acid.

The solum is 38 to 50 inches thick. The silt mantle is 25 to 35 inches thick. Reaction is very strongly acid to medium acid except where the soil has been limed. The IIC horizon is strongly acid to slightly acid.

The Ap horizon has a hue of 10YR, value of 4 or 5, and chroma of 2. The Bt horizon has a hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 6. The B2t horizon above the IIB horizon is silt loam to silty clay loam, and the IIB horizon is sandy clay loam or gravelly sandy clay loam to gravelly loam or gravelly clay loam.

In Portage County, the Wheeling soils are slightly more silty and slightly more acid than Wheeling soils mapped elsewhere. This difference does not alter the use or management of these soils.

Wheeling soils are commonly next to Chili and Wooster soils. They have more silt and less gravel in the upper part of the subsoil than Chili soils. They lack the fragipan and underlying glacial till characteristic of Wooster soils.

WhA—Wheeling silt loam, 0 to 2 percent slopes. This is a nearly level soil on outwash terraces, mainly in the southwestern part of the county. It has the profile described as representative of the series. Most areas of this soil are variable in size and shape. Included in mapping are spots of Chili soils, particularly in areas that are slightly elevated or that are convex in shape.

Runoff is slow. There are no major limitations to the use of this soil for cultivated crops. There are few limitations for most nonfarm uses. Capability unit I–1; woodland suitability group 1o1.

WhB—Wheeling silt loam, 2 to 6 percent slopes. This is a gently sloping soil on undulating terraces. Most areas are less than 10 acres in size. Included in mapping are a few spots of Chili soils, particularly in the more sloping areas.

Runoff is slow to medium, and the hazard of erosion is moderate if this soil is cultivated. Slope is a limitation to some nonfarm uses of this soil. Capability unit IIe–1; woodland suitability group 1o1.

Wooster Series

The Wooster series consists of deep, well drained, gently sloping to very steep soils that formed in loam glacial till. These soils are on uplands mainly in the southwestern and north-central parts of the county.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. The upper part of the subsoil, between depths of 9 and 23 inches, is yellowish brown and dark yellowish brown loam. The lower part of the subsoil, to a depth of 43 inches, is a very firm and brittle dark yellowish brown loam fragipan. The substratum to a depth of 60 inches is dark yellowish brown loam glacial till.

Wooster soils have a moderately deep root zone and a moderate available water capacity. Permeability is moderate above the fragipan and moderately slow in the fragipan. A temporary perched water table of short duration may occur above the fragipan during wet periods, but artificial drainage is generally not needed. These soils warm up and dry out early in spring.

Most Wooster soils are used for cultivated crops and meadow crops. The more sloping Wooster soils are used as woodland or pasture. The main crops are corn, wheat, and grass-legume meadow.

Representative profile of Wooster silt loam, 2 to 6 percent slopes, in Shalersville Township, 4 miles north of Ravenna, 900 feet west of the center of Infirmary Road, and 1,400 feet south of Webb Road (Profile PG–10 in the section "Laboratory Data"):

Ap—0 to 9 inches; dark grayish brown (10YR 5/4) silt loam; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

B21t—9 to 19 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; thin very patchy light yellowish brown (10YR 6/4) silt coatings on ped faces; thin patchy light yellowish brown (10YR 6/4) clay films on ped faces; strongly acid; clear wavy boundary.

B22t—19 to 23 inches; dark yellowish brown (10YR 4/4) loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin patchy pale brown (10YR 6/3) silt coatings on ped faces; thin patchy light yellowish brown (10YR 6/4) clay films on ped faces; about 7 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx1—23 to 34 inches; dark yellowish brown (10YR 4/4) loam; weak very coarse prismatic structure parting to weak thick platy; very firm, slightly brittle; prisms have a yellowish red (5YR 5/6) rind and an outer layer of light brownish gray (10YR 6/2) that has coatings of thin patchy light yellowish brown (10YR 6/4) clay films; about 7 percent coarse fragments; very strongly acid; clear smooth boundary.

Bx2—34 to 43 inches; dark yellowish brown (10YR 4/4) loam; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; prisms have a brown (7.5YR 4/4) and yellowish red (5YR 5/6) rind, and an outer layer of light yellowish

brown (10YR 6/4) that has a coating of thin patchy light yellowish brown (10YR 6/4) clay films; about 7 percent coarse fragments; very strongly acid; gradual smooth boundary.

C—43 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; about 7 percent coarse fragments; very strongly acid.

The solum is 40 to 50 inches thick. It is very strongly acid to medium acid except where the soil has been limed. Depth to the top of the fragipan is 20 to 30 inches.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). In uncultivated areas, the A1 horizon is 1 to 5 inches thick. It has a hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Where present, the A2 horizon is 2 to 8 inches thick.

The B2 horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. It is loam or silt loam. The Bx horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. It is typically loam, but is gravelly loam in some places. The C horizon is dark brown (10YR 4/3) to yellowish brown (10YR 5/4) sandy loam to silt loam or the gravelly analogs of those textures.

Wooster soils are the well drained member of a drainage sequence that includes the moderately well drained Canfield soils, the somewhat poorly drained Ravenna soils, and the poorly drained Frenchtown soils. Wooster soils are commonly adjacent to Canfield, Chili, Loudonville, and Wheeling soils. These soils have a fragipan and formed in glacial till, whereas Chili and Wheeling soils lack a fragipan and overlie sand and gravel, and Loudonville soils also lack a fragipan and are deeper to bedrock.

Wooster soils are mapped in a complex with Chili soils in some places. Refer to the Chili series for descriptions of these mapping units.

WuB—Wooster silt loam, 2 to 6 percent slopes. This is a gently sloping soil on undulating uplands and on side slopes adjacent to drainageways. It has the profile described as representative of the series. Most areas of this soil are more than 10 acres in size.

Included in mapping are a few moderately eroded areas that have a lighter colored surface layer and that commonly have poorer tilth than uneroded areas of this soil. In many areas sandstone bedrock is at a depth of 4 to 6 feet. A few spots of the wetter Canfield soils are also included on low slopes or in seepy areas. In a few areas the soil does not have a fragipan.

Runoff is medium, and the hazard of erosion is moderate if this soil is cultivated. Moderately slow permeability in the fragipan and slope are limitations to some nonfarm uses of this soil. Capability unit IIe-1; woodland suitability group 1o1.

WuC—Wooster silt loam, 6 to 12 percent slopes. This is a sloping soil that is mostly wooded. Areas of this soil are highly variable in size and shape. Included in mapping are some spots of the wetter Canfield soils on low slopes or at the base of knolls and areas that lack a fragipan.

Because runoff is medium, the hazard of erosion is severe if this soil is cultivated. Slope and moderately slow permeability in the fragipan are limitations to some nonfarm uses of this soil. Capability unit IIIe-1; woodland suitability group 1o1.

WuC2—Wooster silt loam, 6 to 12 percent slopes, moderately eroded. This is a sloping soil on rolling to undulating uplands and on side slopes adjacent to drainageways. This soil has lost 25 to 75 percent of the original surface layer through erosion. This results in a shallower depth to the fragipan, a slightly lower content of organic matter, and reduced fertility. Water infiltration into the surface layer is slower in this soil than in uneroded Wooster soils.

Included in mapping are areas of soils that have sandy and gravelly material in the lower part of the subsoil. In these areas the soils generally do not have a fragipan.

Runoff is medium to rapid, and the hazard of erosion is severe if this soil is cultivated. Slope and moderately slow permeability in the fragipan are limitations to many nonfarm uses of this soil. Capability unit IIIe-1; woodland suitability group 1o1.

WuD2—Wooster silt loam, 12 to 18 percent slopes, moderately eroded. This is a moderately steep soil along drainageways and on knolls. It has been moderately eroded. Erosion has lowered the available water capacity, the content of organic matter, and the soil fertility. The surface layer is slightly lighter colored and has slightly more coarse fragments than that of uneroded Wooster soils. Included in mapping are areas where the soil does not have a fragipan.

The hazard of erosion is very severe if this soil is cultivated. This soil is well suited to pasture and hay crops, but it is not well suited to row crops. Slope is the major limitation of this soil for nonfarm uses. Capability unit IVe-2; woodland suitability group 1r1.

WuE2—Wooster silt loam, 18 to 50 percent slopes, moderately eroded. This is a steep to very steep soil on side slopes along drainageways. It has a profile similar to the one described as representative of the series, but the fragipan is closer to the surface and is thinner. Approximately 50 percent of the original surface layer has been lost through erosion.

Included with this soil in mapping are areas of soils that have a surface layer of loam and areas of soils that have sand and gravel in the subsoil. These included soils are more droughty than this Wooster soil. In a few areas this soil does not have a fragipan.

Runoff is very rapid, and the hazard of erosion is severe unless a thick plant cover is maintained. This soil is suited to pasture on all but the steepest slopes. Slope is the major limitation for nonfarm uses. Capability unit VIe-2; woodland suitability group 1r2.

Formation and Classification of the Soils

In this section, the factors of soil formation are discussed and related to the soils in Portage County and the processes of soil formation are described. In addition, the system of soil classification is explained and the soils are placed in classes of the system.

Factors of Soil Formation

Every soil is a natural body that has characteristics acquired through the interaction of five soil-forming factors: parent material, topography or relief, living organisms, climate, and time. These factors do not govern the characteristics of each soil to the same degree. In some soils, the influence of one factor overshadows the influence of others. The soil-forming factors control the rate and effects of the physical and chemical process that produces horizon differentiation and a recognizable soil profile.

Climate and living organisms are the active soil-

forming factors. They act upon different parent materials, and their effects are modified by time and topography. Climate and time play an important role in soil formation, but the influence of these factors is so nearly uniform throughout Portage County that it tends to make the soils similar rather than different. The major differences in the soils are largely the result of differences in the kind of parent material, variations in topography, and different times of soil formation.

Parent material

Unconsolidated glacial deposits of Wisconsin age are the major parent material in Portage County. The underlying bedrock and recent deposits of alluvium and organic residue are minor in extent.

Several periods of glaciation have passed over the area that is now Portage County. The Wisconsin age deposits of the Pleistocene Epoch are the only ones at the surface. These deposits consist of moraines, till plains, outwash, and lacustrine material.

Three surface till deposits have been recognized in Portage County (*12*). These are loamy Kent till, light silty clay loam Lavery till, and silty clay loam or silty clay Hiram till.

Kent till is in the south-central and north-central parts of the county. It is loam or silt loam and has been leached of carbonates to a depth of 6 to 10 feet. It contains a high proportion of sandstone and siltstone fragments derived mainly from local bedrock. Wooster, Canfield, Ravenna, and Frenchtown soils formed in this till.

The Lavery till generally is between the Kent till and the Hiram till in a north-south belt in the east-central part of the county. It is silt loam, light silty clay loam, or clay loam and has been leached of carbonates to a depth of 4 to 6 feet. Rittman, Wadsworth, and Frenchtown soils formed in this till.

The northwestern and eastern parts of the county are covered by the silty clay loam or silty clay Hiram till. It contains some sandstone and siltstone fragments of local origin. This till is leached of carbonates to a depth of 2½ to 4 feet. Ellsworth, Mahoning, Geeburg, Remsen, and Trumbull soils formed in the Hiram till. All of the soils that formed in the Hiram till have a higher clay content in the subsoil and substratum than soils that formed in the Kent or the Lavery tills.

Outwash gravel and sand deposits are most extensive in the southwestern part of the county and along the Cuyahoga River in the north-central part. The gravel and sand were derived from sandstone, shale, and crystalline rocks. The material is better sorted in the valley trains than in the kames. The gravel deposits are commonly low in carbonates. Lakin, Chili, Bogart, Oshtemo, Jimtown, Damascus, and Olmsted soils formed in outwash materials. They commonly have a higher percentage of coarse fragments and are coarser in texture than other soils in the county.

Silt and clay slack water, or lacustrine, material is in the lowlands mainly in the northern half of the county. This material ranges from silt loam to clay, and it is neutral to calcareous. Caneadea and Canadice soils formed in the clayey textured materials, and Glenford, Fitchville, and Sebring soils formed in the silty textured materials.

Recent alluvium, consisting of silt loam, loam, and sandy loam material, occurs along most of the streams in the county. This material is commonly slightly acid to neutral. Tioga, Orrville, and Holly soils formed in this material.

Kettle holes and former glacial drainageways, which contain organic deposits, are common in Portage County. The deposits in these areas range in thickness from a few feet to as much as 10 feet or more. They are composed of mixed organic material derived from wood and grasses or sedges. Carlisle, Linwood, and Wallkill soils formed in this material.

The consolidated rocks, which underlie the glacial deposits, consist of conglomerates, sandstone, and shale mainly of Pennsylvanian age. Generally, these rocks are covered by sufficient glacial deposits that they have little direct influence as parent material.

Many of the hills in the county are capped by resistant conglomerate and sandstone. Where this rock is close to the surface or crops out, it has an influence as parent material for Loudonville, Hornell, Dekalb, and Mitiwanga soils. Loudonville, Hornell, and Mitiwanga soils formed partly in thin glacial till and partly in weathered rock. Dekalb soils show little or no influence of glacial till.

Relief

Relief, or topography, has affected the formation of the soils in Portage County chiefly through its effect on the water on or in the soil. The differences in relief have a strong influence in determining the natural drainage and aeration of the soil. For example, poorly drained Sebring soils and very poorly drained Lorain soils in nearly level areas and depressions are frequently wet because of a fluctuating water table and seepage from surrounding soils. Poor aeration and drainage in these soils result in the reduction, translocation, and segregation of soil compounds, principally of iron, indicated by mottled colors dominated by gray. Poor drainage has also caused organic matter to accumulate in Lorain soils, because organic matter generally decomposes more slowly in wet soils. The well drained Wooster soils, on the other hand, occur where the slope is sufficiently steep to permit free runoff. The dominant brown color in their solum indicates good aeration and drainage, thus oxidation of soil compounds, notably iron, and the accumulation of a relatively small amount of organic matter.

Relief by itself is not always sufficient to affect the moisture and aeration of a soil. Important differences in parent material and soil characteristics commonly correspond with differences in relief in Portage County. This can be seen by comparing the dominant slope range of soils that have various drainage patterns and that formed in different parent tills. The wetter soils that formed in the finer textured tills are generally steeper than those that formed in coarser textured tills. Well drained soils rarely form in silty clay loam or finer tills.

Climate

Climate is an active factor in soil formation. Portage County has a humid climate, and rainfall (about 36–37 inches) is fairly evenly distributed throughout

the year. Climatic data for the county are given in the section "General Nature of the County."

Climatic factors that are important in soil formation are precipitation, temperature, and the evapotranspiration ratio. These factors are interrelated with types of vegetation and, on a regional basis, determine the kinds of soil that have developed.

After the retreat of the glaciers the climate was considerably damper and cooler than at present. The present climate supported a hardwood forest vegetation for a long time. Precipitation has been sufficient to cause solution and downward movement of carbonates in almost all of the soils; consequently, most of the soils are acid to a depth of 2 feet or more. A wet microclimate developed in nearly level areas or depressions that tend to accumulate water.

Time

The length of time that the land has been exposed to soil-forming processes is an important factor in the formation of soil profiles. All soils require time for the development of distinct soil horizons. The influence of time, however, may be greatly modified by various soil-forming processes, particularly erosion, deposition of material on the soil surface, topography, and the type of parent material.

The soils in Portage County can be separated into two general age groups—one group formed in parent material of Wisconsin age and the other formed in recent deposits on flood plains and low-lying swampy areas. The oldest materials are those deposited by the Wisconsin Glaciation, which occurred about 18,000 to 24,000 years ago.

The present flood plains are subject to deposition, and the soils on them show little differentiation of horizons. The major horizon in these soils is the surface layer, where organic matter accumulates. Successive periods of flooding and new deposition continue the cycle of soil formation.

Living organisms

In Portage County, as in most areas, plants had a much greater role in the development of the soils than animals. A dense forest made up the original cover of the area that is now Portage County. The native trees of the county can be placed into four main forest types: mixed oak forest, mixed mesophytic forest, beech forest, and elm-ash swamp forest.

The mixed oak type is mainly a mixture of white oak, black oak, and hickory. Chili, Oshtemo, and Wooster soils occupy a large acreage originally covered by trees of this type.

The mixed mesophytic forest consists of broadleaf and deciduous trees that have no single dominant species. Canfield, Ravenna, Rittman, Wadsworth, and Mahoning soils are in the area of this forest type.

The beech forest consists mainly of beech, sugar maple, red oak, white ash, and white oak. The Mahoning, Remsen, and Wadsworth soils are in areas of this forest type.

The elm-ash swamp forest consists of a mixture of white elm, black ash, white ash, pin oak, and red maple. Many of the poorly drained soils, such as Sebring, Trumbull, and Frenchtown soils, commonly occur in areas of this forest type.

Scattered areas of sphagnum peat bogs are occupied mainly by Carlisle and Linwood soils.

Little of the process of soil formation can be directly traced to the effects of animal life. Various animals and organisms, however, contribute large quantities of organic remains to soils and thus influence their chemistry. They are likewise responsible to some degree for aeration and mixing of soil materials.

Man's activities in the past 175 years have begun to influence the future course of soil development. Large areas of wet soils have been drained and aerated. Many soils have received large amounts of lime, fertilizer, and organic matter. Much of the native woodland has been cleared, and these areas are used for farming. Many areas have been cut and filled or covered with impermeable material. These activities have been responsible for accelerating erosion on many soils. This alteration of the soil-forming factors will eventually change the development of the soils.

Processes of Soil Formation

The factors of soil formation control or influence the four soil-forming processes of addition, loss, transfer, and alteration (*8*). Some of the processes promote differences within a soil, others retard or preclude differences.

Additions to the soil include the addition of organic matter to the surface layer, addition of bases in the organic matter and in ground water, erosional deposition, and the addition of bases contained in lime and fertilizer. The dark-colored surface layer of Olmsted soils is evidence of the accumulation of organic matter. All of the soils originally had at least a thin layer of organic accumulation, but in some places cultivation nearly destroyed it. In all the soils, plant nutrients are recycled from soil to plants and back to soil again in the form of litter or organic materials. Tioga, Orrville, and Holly soils periodically receive additions of soil material from flooding. The increase in plant nutrients that results from applying lime and fertilizer in cultivated areas counteracts, or can even exceed, losses of plant nutrients that occur normally.

Losses in the soil include removal of bases by leaching, removal of plant nutrients by crops, and loss of soil material through erosion. Most significant in Portage County is the leaching of carbonates. In upland soils, such as Canfield soils, carbonates have been removed to a depth of 6 to 10 feet. Other minerals in the soil break down and are lost through leaching but at a slower rate than the carbonates. The alteration of other minerals produces free iron oxides which cause the bright reddish or brownish colors in Wooster and Wheeling soils. The mottling observed in all but the well drained soils is caused by the reduction and resegregation of iron oxides that result from excess water or a slowly permeable soil horizon.

The most significant transfers in the soils of Portage County involve transfers of colloidal material from the surface layer to a greater depth. Fine clays are suspended in percolating water moving downward from the surface layer. Seasonal drying or precipitation causes the fine clays to be deposited on the ped faces in cracks or root channels. These coatings are observ-

able in the Wooster, Rittman, and Chili soils. Various sesquioxides are also transferred from the surface layer to a lower horizon in most of the soils.

Transformation of such primary minerals as feldspar and biotite occurs within the zone of weathering. The most important transformation involves the formation of silicate clay material. Illite and vermiculite are two of the most common clays in Portage County. Kaolinite clay indicates fairly intense weathering and occurs in minor amounts in most of the soils throughout the county.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easy to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge to farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories so that information can be applied to large geographic areas.

The system of classifying soils currently used by the National Cooperative Soil Survey was developed in the early sixties and was adopted in 1965 (*11*). It is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 9 shows the classification of each soil series of Portage County by family, subgroup, and order, according to the current system.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that give broad climatic groupings of soils. The two exceptions to this are Entisols and Histosols, which

TABLE 9.—*Classification of the soils* [1]

Soil series	Family	Subgroups	Order
Bogart	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Canadice	Fine, illitic, mesic	Typic Ochraqualfs	Alfisols.
Caneadea	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Canfield	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Carlisle	Euic, mesic	Typic Medisaprists	Histosols.
Chili	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Damascus	Fine-loamy, mixed, mesic	Typic Ochraqualfs	Alfisols.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Ellsworth	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols.
Fitchville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Frenchtown	Fine-loamy, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Geeburg	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols.
Glenford	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Haskins	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Holly	Fine-loamy, mixed, non-acid, mesic	Typic Fluvaquents	Entisols.
Hornell	Fine, illitic, acid, mesic	Aeric Haplaquepts	Inceptisols.
Jimtown	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Lakin	Mixed, mesic	Alfic Udipsamments	Entisols.
Linwood	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Lorain	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols.
Loudonville	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Mahoning	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Mitiwanga [2]	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Mitiwanga variant	Fine-loamy, mixed, mesic	Aquultic Hapludalfs	Alfisols.
Olmsted	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols.
Orrville	Fine-loamy, mixed, non-acid, mesic	Aeric Fluvaquents	Entisols.
Oshtemo	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Ravenna	Fine-loamy, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Remsen	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Rittman	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Sebring	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Sebring variant	Fine-silty, mixed, mesic	Mollic Ochraqualfs	Alfisols.
Tioga	Coarse-loamy, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Trumbull	Fine, illitic, mesic	Typic Ochraqualfs	Alfisols.
Wadsworth	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Wallkill [2]	Fine-loamy, mixed, non-acid, mesic	Thapto Histic Fluvaquents	Entisols.
Wheeling [2]	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Wooster	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.

[1] Placement of some series in the system of classification may change as more precise information becomes available.
[2] The soil is a taxadjunct to the series. This classification is explained in the individual series description.

occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

SUBORDER. Each order is subdivided into suborders that are based primarily on those soil characteristics that produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu,* meaning water or wet, and *ent*, from Entisol).

GREAT GROUP. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark red and dark brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Haplaquents (*Hapl,* meaning simple horizons, *aqu* for wetness or water, and *ent,* from Entisols).

SUBGROUP. Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

FAMILY. Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when they are used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizon, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (see table 9). An example is the coarse-loamy, mixed, mesic family of Typic Hapludalfs.

SERIES AND TAXADJUNCTS. An explanation of the series concept is given in the section, "How this Survey was Made," in the front of this survey. There are 37 soil series recognized in Portage County. Some of the soils in this county do not fit in a series that has been recognized in the classification system, but recognition of a separate series would not serve a useful purpose. Such soils are named for the series they most strongly resemble because they differ from those series in ways too small to be of consequence in interpreting their usefulness or behavior. Soil scientists designated such soils as taxadjuncts to the series for which they are named. In this survey, soils named in the Mitiwanga, Wallkill, and Wheeling series are taxadjuncts to these series.

Laboratory Data

Laboratory data are given in table 10 for soil profiles representing ten soil series in Portage County. This data was obtained to aid in the classification and correlation of these soils. Analysis was prepared by the Agronomy Department, Ohio Agricultural Research and Development Center (OARDC), Columbus, Ohio. Detailed descriptions of the soils sampled, including locations of the profiles described, are given in the section, "Descriptions of the Soils."

In addition to the data in table 10, laboratory data are available for most soil series in Portage County. These data are from other counties in northeast Ohio, and are on file at the Agronomy Department, OARDC, Columbus, Ohio; the Ohio Department of Natural Resources, Division of Lands and Soil, Columbus, Ohio; and the Soil Conservation Service, State Office, Columbus, Ohio. Clay minerals are evaluated in table 11.

The following paragraphs outline some of the procedures used to obtain the data presented in table 10.

Particle size distribution data were obtained by the pipette method (*9*), but using sodium hexametaphosphate as the dispersing agent and a 10-gram soil sample. The sand fractions were determined by sieving. The percentage of fine silt and coarse clay (20–0.2 micron) was determined by sedimentation, and the percentage of fine clay ($<$0.2 micron) was determined by gravity sedimentation in a centrifuge.

Coarse silt was obtained by subtracting sand, fine silt, and clay from the total sample. The percentage of organic matter was determined by a dry combustion method. Extractable K, Ca, and Mg were extracted by N ammonium acetate and were measured by atomic adsorption spectrophotometer. Extractable H (which also includes titratable Al) was determined by the triethanolamine method (*6*), and cation exchange capacities were calculated by the summation of extractable cations. Calcium carbonate equivalent was determined by the quantitative gasometric method (*4*).

The kinds of clay minerals are identified in Caneadea, Rittman, and Geeburg soils in table 11. These data were prepared by the Agronomy Department, OARDC, Columbus, Ohio, under the direction of Dr. L. P. Wilding.

Procedures for x-ray analysis and for the interpretation of x-ray defractograms are essentially the same as reported previously.

Caneadea (PG–1) soils formed in lacustrine sediments, but Rittman (PG–2) and Geeburg soils (PG–S12) formed in glacial till deposits. According to the data in table 11, mineralogical placement of the Caneadea and Geeburg soils is illitic and is in support of the current placement of these series. The Rittman soil is not fine textured, thus clay mineralogy is not used at the family level for placement. However, data in table 11 also indicate that the clay fraction of this soil is dominantly illite.

Caneadea, Rittman, and Geeburg soils have similar

TABLE 10.—*Laboratory*

[Analyses made by the Ohio Agricultural Research and Development

Soil and sample number	Horizon	Depth	Particle size distribution								
			Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (0.002 mm)	Fine clay (0.0002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Bogart (PG–4)	Ap	0–7	1.7	4.7	5.1	7.0	5.0	23.5	53.1	23.4	10.1
	B1	7–16	1.9	5.5	7.3	10.6	6.2	31.5	46.5	22.0	7.7
	B21t	16–24	4.0	9.8	11.5	15.3	6.9	47.5	32.0	20.5	6.1
	IIB22t	24–37	11.5	23.6	14.3	10.8	3.3	63.5	16.1	20.4	7.7
	IIB3	37–46	18.5	21.4	13.0	7.8	2.2	62.9	17.6	19.5	6.0
	IIC	46–60	14.3	19.5	11.4	10.2	3.6	59.0	18.6	22.4	9.2
Canadice (PG–11)	Ap	0–8	1.8	3.0	4.3	6.5	1.6	17.2	56.0	26.8	8.2
	B21tg	8–16	0.5	2.7	5.1	7.8	2.7	18.8	50.4	30.8	9.5
	B22tg	16–26	0.5	2.1	4.8	7.6	3.4	18.4	42.7	38.9	15.7
	B23tg	26–32	0.6	2.3	3.8	7.6	1.2	15.5	44.8	39.7	14.9
	B24tg	32–43	0.2	1.7	2.9	4.9	2.6	12.3	45.1	42.6	15.6
	B3	43–53	0.1	0.8	1.7	2.5	0.6	5.7	41.9	52.4	15.6
	C	53–63	0.0	0.1	0.2	0.7	0.8	1.8	49.9	48.3	10.8
Caneadea (PG–1)	Ap	0–7	0.3	1.4	1.9	4.5	3.7	11.8	61.4	26.8	7.9
	B&A	7–10	0.1	0.5	0.7	2.0	2.1	5.4	47.1	47.5	15.7
	B21t	10–17	0.1	0.2	0.3	1.0	0.6	1.5	40.1	57.1	21.4
	B22t	17–23	0.0	0.2	0.2	0.5	0.2	0.5	36.9	61.6	21.8
	B23t	23–29	0.0	0.0	0.1	0.2	0.1	0.2	34.7	64.8	20.1
	B24t	29–36	0.0	0.0	0.0	0.1	0.1	0.2	37.1	62.7	20.3
	B3	36–48	0.0	0.0	0.0	0.1	0.1	0.2	51.9	47.9	15.5
	C1	48–57	0.0	0.0	0.0	0.1	0.1	0.2	51.4	48.4	15.2
	C2	57–68	0.3	0.5	0.2	0.3	0.3	1.6	43.2	55.2	15.6
Canfield (PG–3)	Ap	0–8	1.3	5.0	0.2	9.5	6.3	28.3	58.6	13.1	1.8
	B1	8–11	1.5	4.6	5.5	9.2	5.1	25.9	56.9	17.2	4.1
	B21t	11–16	2.4	6.1	8.1	11.7	6.2	34.5	47.3	18.2	6.6
	B22t	16–22	2.9	7.3	11.6	17.5	8.0	47.3	35.2	17.5	7.3
	Bx1t	22–30	3.4	8.4	11.8	18.4	8.4	50.4	35.3	14.3	5.7
	Bx2t	30–38	3.6	8.5	12.3	19.0	8.9	52.3	33.9	13.8	4.0
	Bx3	38–46	4.4	8.9	12.2	18.5	8.1	52.1	34.3	13.6	3.2
	B3	46–59	3.9	11.3	13.3	19.2	8.5	56.2	31.8	12.0	3.0
	C1	59–69	3.6	7.9	9.6	15.2	7.8	44.1	39.5	16.4	3.7
	C2	69–82	4.1	9.0	11.2	19.2	10.8	54.3	37.7	8.0	1.5
Ellsworth (PG–7)	Ap	0–9	1.4	3.9	4.3	6.8	1.9	18.3	63.7	18.0	5.0
	B1	9–13	0.6	1.6	2.0	3.5	3.0	10.7	55.6	33.7	12.6
	B21t	13–21	0.4	1.3	1.7	4.1	1.5	9.0	49.0	42.0	20.4
	B22t	21–27	0.8	1.1	1.5	3.1	1.5	8.0	52.5	39.5	15.8
	C1	32–39	0.2	0.8	1.2	3.2	2.6	8.0	55.8	36.2	13.1
	C1	39–47	0.2	1.0	1.4	2.7	2.0	7.3	58.0	34.7	13.1
	C2	47–60	0.7	1.1	0.7	1.7	0.9	5.1	53.0	41.9	13.0
Geeburg (PG–S12)	Ap	0–7	0.7	1.3	2.1	3.8	3.7	11.1	58.0	30.9	6.8
	A&B	7–9	0.7	0.9	1.1	1.8	2.3	6.8	42.8	50.4	15.1
	B21t	9–12	0.4	0.6	0.8	0.9	2.1	4.8	38.4	56.8	20.9
	B22t	12–16	0.6	0.6	0.7	1.3	1.8	5.0	34.8	60.2	21.9
	B22t	16–20	0.4	0.4	0.6	1.1	1.2	3.7	33.2	63.1	23.4
	B23t	20–30	1.7	0.8	0.9	1.5	0.8	5.7	38.9	55.4	15.4
	C1	30–38	0.3	0.7	0.9	1.5	1.8	5.2	39.2	55.6	15.0
	C2	38–48	0.4	0.6	0.8	1.4	2.0	5.2	39.5	55.3	15.3
	C2	48–60	0.2	0.7	1.0	1.3	1.8	5.0	40.4	54.6	15.3
Rittman (PG–2)	Ap	0–9	2.1	4.9	7.4	12.7	6.5	33.6	51.3	15.1	1.8
	B&A	9–14	1.4	3.7	5.9	10.1	5.4	26.5	54.3	19.2	3.9
	B21t	14–19	1.6	3.3	5.5	9.7	5.8	25.9	47.0	27.1	8.1
	B22t	19–22	1.2	2.8	4.7	8.8	5.7	23.2	43.7	33.1	11.4
	B23t	22–26	1.6	3.3	6.1	12.0	7.4	30.4	38.6	31.0	12.7
	Bx1	26–30	1.5	3.1	6.0	13.4	7.1	31.1	38.5	30.4	11.2
	Bx1	30–35	1.5	3.1	5.9	13.2	6.6	30.3	40.4	29.3	9.1
	Bx2	35–41	2.0	4.2	6.5	11.2	6.8	30.7	41.2	28.1	9.4
	Bx2	41–47	1.8	4.2	6.7	11.2	6.5	30.4	42.2	27.4	8.6
	B3	47–51	2.3	3.6	5.3	10.1	6.8	28.1	44.8	27.1	8.0
	B3	51–55	2.0	3.4	5.4	10.9	7.6	29.3	45.4	25.3	7.6
	C	55–62	1.9	3.5	5.1	10.4	7.1	28.0	45.3	26.7	8.0
	C	62–70	2.1	3.4	4.9	9.6	6.5	26.5	44.5	29.0	9.1

See footnote at end of table.

data

Center, Columbus, Ohio. Dashes indicate that no test was made]

Textural class	Reaction	Organic-matter content	Calcium car-bonate equiv-alent	Extractable cations (milliequivalents per 100 grams of soil)				Sum of extract-able cations	Sum of bases	Base satu-ration
				H	Ca	Mg	K			
	pH	*Percent*	*Percent*					*Meq per 100 gm of soil*	*Meq per 100 gm of soil*	*Percent*
Silt loam	4.9	4.6	----	18.7	2.7	0.6	.43	22.4	3.7	17
Loam	4.8	0.6	----	11.6	1.5	0.7	.28	14.1	2.5	18
Loam	4.6	0.6	----	10.7	1.8	0.5	.28	13.3	2.6	19
Sandy clay loam	5.0	0.6	----	9.4	1.7	0.6	.37	12.1	2.7	22
Coarse sandy loam	4.9	0.6	----	8.5	1.8	0.8	.38	11.5	3.0	26
Sandy clay loam	5.2	0.6	----	10.0	3.1	1.5	.36	15.0	5.0	33
Silt loam	5.3	7.3	----	13.0	9.2	3.8	.42	26.4	13.4	51
Silty clay loam	5.0	2.2	----	9.4	5.3	2.9	.19	17.8	8.4	47
Silty clay loam	4.8	1.2	----	8.7	6.0	3.6	.24	18.5	9.8	53
Silty clay loam	5.5	0.8	----	7.0	7.3	4.4	.22	18.9	11.9	63
Silty clay	6.1	0.6	----	5.3	8.5	5.3	.20	19.3	14.0	73
Silty clay	7.1	0.8	----	3.1	11.3	5.2	.21	19.8	16.7	84
Silty clay	7.6	----	1.5	----	----	----	----	----	----	----
Silt loam	4.5	4.1	----	18.2	1.1	0.6	.33	20.2	2.0	10
Silty clay	4.8	1.0	----	14.9	2.6	3.2	.25	20.9	6.0	29
Silty clay	5.0	0.6	----	12.9	4.0	6.7	.30	23.9	11.0	46
Clay	6.0	0.5	----	7.5	5.0	11.1	.37	24.0	16.5	69
Clay	7.1	0.5	----	2.5	3.8	11.1	.22	17.6	15.1	86
Clay	7.8	----	0.8	----	----	----	----	----	----	----
Silty clay	7.9	----	3.3	----	----	----	----	----	----	----
Silty clay	8.2	----	6.3	----	----	----	----	----	----	----
Silty clay	8.3	----	12.4	----	----	----	----	----	----	----
Silt loam	5.2	3.0	----	8.4	1.6	0.6	.23	10.8	2.4	22
Silt loam	4.8	0.8	----	5.7	1.7	1.0	.14	8.5	2.8	33
Loam	4.6	0.3	----	9.2	1.2	1.0	.17	11.6	2.4	20
Loam	4.5	0.3	----	9.3	1.4	1.1	.18	12.0	2.7	22
Loam	4.3	0.3	----	8.2	1.0	1.2	.13	10.5	2.3	22
Fine sandy loam	4.4	0.3	----	6.3	0.8	1.1	.12	8.3	2.0	24
Fine sandy loam	4.8	0.1	----	5.7	1.9	1.6	.16	9.4	3.7	39
Fine sandy loam	5.0	0.1	----	4.3	2.7	2.0	.09	9.1	4.8	53
Loam	5.6	0.3	----	4.0	5.5	2.6	.09	12.2	8.2	67
Fine sandy loam	6.3	0.1	----	2.1	4.2	1.7	.06	8.1	6.0	74
Silt loam	6.2	3.4	----	7.3	5.1	2.8	.23	15.4	8.1	53
Silty clay loam	4.6	0.6	----	11.6	3.4	1.4	.20	16.6	5.0	30
Silty clay	4.4	0.4	----	13.6	3.8	2.0	.23	19.6	6.0	31
Silty clay loam	4.5	0.5	----	13.8	4.2	1.7	.25	19.9	6.1	31
Silty clay loam	6.4	0.2	----	3.3	4.5	6.2	.17	14.2	10.9	77
Silty clay loam	7.0	0.3	----	2.0	5.3	4.7	.19	12.2	10.2	84
Silty clay	7.7	----	4.5	----	----	----	----	----	----	----
Silty clay loam [1]	5.5	2.8	----	9.2	----	----	----	17.8	8.6	48
Silty clay	4.9	1.7	----	13.4	----	----	----	21.7	8.3	38
Clay	4.7	1.9	----	14.8	----	----	----	23.1	8.3	36
Clay	5.1	1.2	----	10.6	----	----	----	24.6	14.0	57
Clay	7.0	1.2	----	4.6	----	----	----	24.3	19.7	81
Clay	8.0	1.5	11.7	----	----	----	----	----	----	----
Clay	8.0	----	12.3	----	----	----	----	----	----	----
Clay	8.0	----	13.3	----	----	----	----	----	----	----
Silty clay	8.0	----	13.6	----	----	----	----	----	----	----
Silt loam	6.6	2.7	----	5.5	5.8	2.8	.13	14.2	8.7	61
Silt loam	5.8	0.8	----	6.4	2.9	1.9	.08	11.3	4.9	43
Clay loam	4.9	0.6	----	8.9	2.8	1.8	.12	13.6	4.7	35
Clay loam	4.6	0.5	----	12.1	3.1	2.0	.16	17.4	5.3	30
Clay loam	4.6	0.5	----	11.3	2.7	2.2	.19	16.4	5.1	31
Clay loam	4.6	0.3	----	9.9	2.7	2.3	.15	15.0	5.1	34
Clay loam	4.7	0.3	----	10.7	3.4	2.7	.13	16.9	6.2	37
Clay loam	5.0	0.3	----	7.2	4.6	3.2	.16	15.2	8.0	53
Clay loam	5.9	0.5	----	5.5	5.7	3.4	.13	14.7	9.2	63
Clay loam	6.5	0.3	----	2.7	6.0	3.5	.12	12.3	9.6	78
Loam	6.7	0.3	----	3.0	5.7	3.2	.11	12.0	9.0	75
Loam	7.1	0.3	----	3.6	6.6	3.3	.10	13.6	10.0	74
Clay loam	7.6	----	1.4	----	----	----	----	----	----	----

TABLE 10.—*Laboratory*

Soil and sample number	Horizon	Depth	Particle size distribution: Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Total sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (0.002 mm)	Fine clay (0.0002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Wadsworth (PG–S6)	Ap	0–7	--------	--------	--------	--------	--------	20.9	62.1	17.0	--------
	B1	7–11	--------	--------	--------	--------	--------	13.7	54.5	31.8	--------
	B21t	11–18	--------	--------	--------	--------	--------	13.6	53.5	32.9	--------
	B22t	18–28	--------	--------	--------	--------	--------	12.9	50.2	36.9	--------
	Bx1	28–40	--------	--------	--------	--------	--------	17.3	53.3	29.4	--------
	Bx2	40–50	--------	--------	--------	--------	--------	17.4	54.8	27.8	--------
	B3	50–58	--------	--------	--------	--------	--------	14.0	52.6	33.4	--------
	C	58–64	--------	--------	--------	--------	--------	18.9	49.6	31.5	--------
Wheeling (PG–8)	Ap	0–10	0.6	2.3	2.2	2.5	2.1	9.7	75.1	15.2	4.3
	B1t	10–16	0.4	1.1	1.0	1.3	1.4	5.2	69.1	25.7	10.8
	B21t	16–21	0.6	1.4	1.8	2.4	1.2	7.4	65.1	27.5	13.7
	B22t	21–30	1.0	2.8	3.6	3.9	3.4	14.7	60.5	24.8	14.2
	IIB23t	30–33	5.1	16.1	17.0	9.5	2.3	50.0	23.6	26.4	15.9
	IIB24t	33–39	10.9	19.1	21.5	10.4	1.6	63.5	13.8	22.7	13.9
	IIC1	39–48	11.4	28.2	23.3	14.7	1.5	79.1	5.3	15.6	10.0
	IIC2	48–59	22.7	30.3	20.0	12.2	0.9	86.1	6.0	7.9	5.4
	IIC3	59–70	15.2	30.3	21.9	16.3	2.9	86.3	5.1	8.6	5.0
Wooster (PG–10)	Ap	0–9	1.7	4.7	5.6	10.1	2.3	24.4	61.2	14.4	2.9
	B21t	9–19	1.6	5.0	7.9	15.2	4.7	34.4	45.8	19.8	7.2
	B22t	19–23	2.3	6.8	9.7	15.9	8.1	42.8	40.8	16.4	7.0
	Bx1	23–34	1.4	6.7	9.1	16.5	4.8	38.5	43.5	18.0	7.2
	Bx2	34–43	0.8	4.6	8.2	17.1	9.5	40.2	42.2	17.6	7.0
	C	43–50	1.6	5.1	8.7	16.5	8.7	40.6	41.6	17.8	6.6

[1] Texture is silty clay loam but is near the silt loam and silty clay loam boundary.

kinds of clay minerals. These soils formed in calcareous glacial-lacustrine deposits rich in illite. None of the soils contain more than a trace of discrete expandable minerals, but each contains significant amounts of randomly interstratified minerals, mostly illite, vermiculite, and pedogenic chlorite. In each profile the content of illite increases and the content of vermiculite and interstratified minerals decreases with increasing depth. This reflects pedogenic weathering of interstratified minerals in the upper part of the solum. On the basis of the percentage of clay and the kinds of clay minerals, both Caneadea and Geeburg soils would be classified as having a moderate to high shrink-swell potential in the subsoil. Swelling pressure is the cause of widespread structural damage to buildings in areas of Geeburg soils. In contrast, the subsoil of Rittman soils (B2t and Bx horizons) has a low to moderate shrink-swell potential. The calcareous C horizon has a negligible shrink-swell potential and is structurally strong.

From a soil engineering standpoint, on a per unit clay basis, the hazard of instability would generally be more serious in a soil having more expandable clay mineral components (either montmorillonite or montmorillonite-illite interstratified assemblages) than in a soil having smaller quantities of these components. In spite of this consideration, soils high in clay content, even if the clay is not of the expandable kind, often pose serious soil engineering problems.

General Nature of the County

This section discusses briefly the history of Portage County and its economic development, geology, and climate.

Portage County is in the northwestern part of the glaciated Allegheny Plateau and lies on the divide between the Lake Erie and the Ohio River basins. Elevation ranges from a minimum of approximately 910 feet where Eagle Creek leaves the county in northeastern Windham Township to a maximum of 1,340 feet in central Hiram Township.

History and Economic Development

Portage County was originally part of the Connecticut Western Reserve, which was organized in 1800 into Trumbull County. In 1808, part of Trumbull County was established as Portage County.

The first permanent dwelling in what is now Portage County was built in Mantua Township in the spring of 1799. The early settlers emigrated from New England, principally Connecticut.

data—Continued

Textural class	Reaction	Organic-matter content	Calcium carbonate equivalent	Extractable cations (milliequivalents per 100 grams of soil) H	Ca	Mg	K	Sum of extractable cations	Sum of bases	Base saturation
	pH	*Percent*	*Percent*					*Meq per 100 gm of soil*	*Meq per 100 gm of soil*	*Percent*
Silt loam	4.9	2.9		10.7	2.3	0.9	.15	14.1	3.4	24
Silty clay loam	4.8	0.8		9.8	3.7	1.4	.20	15.1	5.3	35
Silty clay loam	4.6			10.2	3.6	1.7	.19	15.7	5.5	35
Silty clay loam	4.6			10.3	3.4	3.3	.23	17.2	6.9	40
Silty clay loam	6.0			3.3	4.3	6.5	.17	14.3	11.0	77
Silty clay loam	6.9			1.8	4.1	5.4	.13	11.4	9.6	84
Silty clay loam	7.2			1.4	5.5	4.7	.17	11.8	10.4	88
Silty clay loam	7.8		5.6							
Silt loam	5.7	2.5		7.8	4.5	1.7	.11	14.1	6.3	45
Silt loam	5.8	0.7		6.3	5.3	2.9	.19	14.7	8.4	57
Silty clay loam	5.3	0.5		7.3	5.7	2.2	.22	15.4	8.1	53
Silt loam	4.8	0.7		7.5	5.0	1.4	.23	14.1	6.6	47
Sandy clay loam	4.6	0.9		9.7	4.7	1.3	.26	16.0	6.3	39
Sandy clay loam	4.8	0.6		8.1	5.0	1.3	.24	14.6	6.5	45
Coarse sandy loam	5.1	0.3		5.7	3.0	0.9	.17	9.8	4.1	42
Loamy coarse sand	5.2	0.3		3.9	1.6	0.8	.05	6.3	2.4	39
Loamy coarse sand	6.3	0.4		3.0	3.3	1.0	.10	7.4	4.4	59
Silt loam	6.8	3.3		5.0	6.8	2.0	.20	14.0	9.0	64
Loam	5.2	0.6		5.8	3.9	1.0	.17	10.9	5.1	47
Loam	4.8	0.3		7.8	3.1	0.8	.15	11.8	4.0	34
Loam	4.7	0.3		7.0	2.3	1.2	.12	10.6	3.8	34
Loam	4.8	0.3		6.4	2.2	2.0	.12	10.7	4.3	40
Loam	4.9	0.3		5.8	2.0	2.2	.10	10.1	4.3	43

Agricultural products grown in the county are a major source of income. Field crops and livestock are the principal items produced.

Industry has grown in Portage County. Rubber and plastic products, transport and construction equipment, cast metal, machine tools, and other metal products are produced in the county.

The mineral industries in Portage County produce sand and gravel, crushed sandstone, and coal. Shale is mined in Palmyra Township for the manufacture of sewer tile and allied clay products. The county also produces a limited amount of oil and natural gas.

Water for industry, urban and domestic needs, and to a limited extent for irrigation of specialized farm crops is available from surface storage and from aquifers in buried glacial valleys in the county.

Geology

Portage County was completely covered by continental glaciers during the Wisconsin and Illinoian ages and probably during previous glacial periods (*12*). During the most recent, the Wisconsin glacial period, parts of Portage County were covered by two coincident glacier lobes. The Killbuck Lobe occurred in the northern half of the western tier of the townships, and the Grand River Lobe covered most of the rest of the county. These lobes did not meet, but they advanced and retreated repeatedly. The area between the two lobes is called an interlobate zone. It begins in central Geauga County, extends through the western third of Portage County, and continues southwestward through Summit County and into Stark County. This interlobate area consists of sand and gravel and interbedded layers of till.

The first advance of the Wisconsin Glacier deposited glacial till that was relatively low in clay content. Wooster and Canfield soils formed in this till. The less extensive second major advance deposited till having relatively more clay than the first deposits. The Rittman and Wadsworth soils formed in this till. The third advance, less extensive than the others, deposited till with a high content of clay. The Mahoning and Ellsworth soils formed in this till. In Portage County, only the Grand River Lobe had a fourth advance, which deposited a clayey till that had a very high clay content. The Remsen and Geeburg soils formed in that clay till.

The rock hills in the northern part of the county have a northwest-southeast orientation that parallels the movements of the glacial lobes. Sandstone outcrops in some of the steeper areas where there is no till cover.

Numerous valleys are buried under the glacial drift in Portage County. During or before the Illinoian gla-

TABLE 11.—*Clay minerals in selected soils*

[Dashes mean "not detected." Trace means "less than 3 percent"]

Soil and Sample number	Horizon	Depth	Clay size	Illite (mica)	Expand-ables	Vermic-ulite	Chlorite	Kaolinite	Quartz	Interstratified[1]
		Inches	*Micron*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Caneadea (PG–1)	Ap	0–7	<2	30	----------	10	5	<5	10	40 (V,Chl/I, and M/I)
	B22t	17–23	<2	55	----------	10	5	<5	<5	20 (V,Chl/I, and M/I)
	C2	57–68	<2	80	----------	5	10	5	Trace	----------
Geeburg (PG–S12)	B22t	12–20	<0.08	40	Trace	6	Trace	----------	----------	54 (V,Chl/I)
		12–20	0.08–0.2	72	Trace	14	3	3	4	4 (V,Chl/I)
		12–20	0.2–2	68	----------	14	10	Trace	8	----------
	C2	38–48	<0.08	74	Trace	5	Trace	Trace	----------	21 (V,Chl/I)
		38–48	0.08–0.2	79	----------	6	5	5	5	Trace
		38–48	0.2–2	81	----------	6	4	3	3	3 (V,Chl/I)
Rittman (PG–2)	Ap	0–9	<2	15	----------	25	15	<5	10	30 (V,Chl/I)
	B21t	14–19	<2	45	----------	20	Trace	<5	10	15 (V,Chl/I)
	B23t	22–26	<2	50	----------	20	----------	<5	10	20 (V,Chl/I)
	Bx2	41–47	<2	50	----------	15	----------	<5	<5	30 (V,Chl/I)
	C	62–70	<2	60	----------	15	Trace	<5	<5	15 (V,Chl/I)

[1] Interstratified groupings listed in order of prevalence. V,Chl/I = interstratified nonexpandable 14–10A components (presumably vermiculite-chlorite-illite). M/I = interstratified expandable 14–10A components (presumably montmorillonite-illite).

cial advance, the ice deepened the valleys and smoothed the valley walls; then the advancing Wisconsin Glacier filled these valleys with gravel, sand, silt, and clay. Valleys were filled with silt and clay if outlets were blocked by the glacier; open valleys were filled mainly with sand and gravel.

The bedrock underlying the glacial deposits and outcropping in places is a member of the Pottsville Formation of the Pennsylvanian System. It is mainly acid sandstone and shale. The regional dip of the bedrock strata averages 5 to 10 feet per mile toward the south. Dekalb, Loudonville, Mitiwanga, and Hornell soils are mapped where bedrock is at a depth of less than 40 inches.

Climate

The climate of Portage County is continental and is marked by large annual, daily, and day-to-day ranges in temperatures. Northerly winds blowing off Lake Erie do little to modify surface temperatures in Portage County, but they often bring snowstorms of varying intensity in the colder months. Summers are moderately warm and humid. The temperature exceeds 89°F on about 10 days out of the year. Winters are reasonably cold and cloudy; the temperature is below zero on an average of 6 days. Weather changes occur every few days as a result of the passing of cold or warm fronts and their associated centers of high and low pressures.

Climatic data from the weather station at Ravenna is listed in table 12. This is fairly representative of the average temperatures and precipitation throughout Portage County.

Normal mean temperature for the year in the Ravenna area is one degree below the average for northeast Ohio. On nights with clear skies and light winds, there is often a wide variation in surface temperatures within Portage County. The daily range in temperature is usually greatest late in summer and early in fall and least in winter. Annual extremes in temperature normally occur soon after June 21 and December 22.

The length of the growing season, which is the number of days between the last freezing temperature of 32°F in spring and the first freezing temperature in fall, averages 133 days in the Ravenna area. The growing season is longer than 154 days in 10 percent of the years and shorter than 112 days in 10 percent of the years. Lake Erie influences the length of the growing season in the northern part of the County. Hiram, for example, has an average growing season of 165 days.

As is characteristic of continental climates, precipitation in the Ravenna area varies widely from year to year; however, it is normally abundant and well distributed throughout the year. Winter is the driest season. Showers and thundershowers account for most of the rainfall during the growing season. Thunderstorms occur on about 35 days each year and are most frequent from April through August. There is great variation in mean annual snowfall within Portage County. Annual snowfall is about 70 inches in the extreme northwest and decreases southeastward to 37 inches in the extreme southeast. In any year, snowfall fluctuates widely from the annual mean.

Evaporation is greatest during the warm months. If evaporation greatly exceeds precipitation for prolonged periods, a drought can occur.

Crops that require a large continuing supply of water in July and August quickly deplete the reserve moisture in the root zone in most soils. Soils that have

TABLE 12.—*Temperature and precipitation data*

[At Ravenna from 1949 to 1966]

Month	Temperature			Precipitation	
	Mean daily maximum	Mean daily minimum	Mean	Mean	Mean amount of snow and sleet
	°F	°F	°F	Inches	Inches
January	35.9	18.3	27.1	2.76	8.9
February	39.0	19.3	29.1	2.16	8.0
March	46.4	25.4	35.9	3.00	9.0
April	60.5	35.9	48.2	3.81	2.0
May	72.0	45.1	58.5	3.32	.2
June	80.3	53.7	67.0	3.64	0
July	83.9	57.3	70.6	3.84	0
August	82.4	55.3	68.8	2.85	0
September	76.5	48.5	62.5	2.48	0
October	66.2	38.8	52.5	2.48	.6
November	50.7	31.1	40.9	2.72	6.2
December	38.0	21.5	29.7	1.96	10.8
Year	60.9	37.5	49.2	35.02	45.7

a deep root zone and a high available water capacity are less prone to moisture deficiencies.

Literature Cited

(1) Allan, P. F., L. E. Garland, and R. Dugan. 1963. Rating northeastern soils for their suitability for wildlife habitat. 28th North Am. Wildl. Nat. Resour. Conf. Wildl. Manage. Inst., pp. 247–261, illus.

(2) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(3) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487–69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(4) Dreimanis, A. 1962. Quantitative gasometric determination of calcite and dolomite by using Chittick apparatus. J. Sediment. Petrol., vol. 32, 3:520–529, illus.

(5) McCarthy, Edward Florince. 1933. Yellow-poplar characteristics, growth and management. U.S. Dep. Agric. Tech. Bull. 356, 58 pp., illus.

(6) Peech, Michael, L. T. Alexander, L. A. Dean, and J. F. Reed. 1947. Methods of soil analysis for soil-fertility investigations. U.S. Dep. Agric. Circ. 757, 25 pp.

(7) Schnur, G. Luther. 1937. Yield, stand, and volume tables for even-aged upland oak forest. U.S. Dep. Agric. Tech. Bull. 560, 88 pp., illus. [Reprinted 1961]

(8) Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Sci. Soc. Am. Proc. 23:152–156, illus.

(9) Steele, J. G. and R. Bradfield. 1934. Significance of size distribution in the clay fraction. Am. Soil Surv. Assoc. Bull. 15:88–93.

(10) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173–188 issued May 1962]

(11) United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436 [754 pp., illus.]

(12) White, George W. 1960. Classification of Wisconsin glacial deposits in northeastern Ohio. U.S. Geol. Surv. Bull. 1121–A, 12 pp.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Drainage class (natural). Refers to the frequency and duration periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and climatic moors."

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Moraine (geology). An accumulation of earth, stones, and other

debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.20 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Capability unit is explained beginning on page 6. Woodland group is explained on page 17.

Map symbol	Mapping unit	Page	Capability unit Symbol	Woodland suitability group Symbol
BgA	Bogart silt loam, 0 to 2 percent slopes	51	IIs-1	2o1
BgB	Bogart silt loam, 2 to 6 percent slopes	51	IIe-4	2o1
BhB	Bogart-Haskins complex, 2 to 6 percent slopes	51	IIw-4	2o1
Ca	Canadice silt loam	65	IVw-1	2w1
CcA	Caneadea silt loam, 0 to 2 percent slopes	67	IIIw-4	2w3
CcB	Caneadea silt loam, 2 to 6 percent slopes	67	IIIw-4	2w3
CdA	Canfield silt loam, 0 to 2 percent slopes	68	IIw-3	1o1
CdB	Canfield silt loam, 2 to 6 percent slopes	68	IIe-2	1o1
CdC	Canfield silt loam, 6 to 12 percent slopes	68	IIIe-2	1o1
CdC2	Canfield silt loam, 6 to 12 percent slopes, moderately eroded	68	IIIe-2	1o1
CfB	Canfield-Urban land complex, undulating	69	-------	---
CfC	Canfield-Urban land complex, rolling	69	-------	---
Cg	Carlisle muck	69	IIIw-2	---
CnA	Chili loam, 0 to 2 percent slopes	71	IIs-1	2o1
CnB	Chili loam, 2 to 6 percent slopes	71	IIe-4	2o1
CnC	Chili loam, 6 to 12 percent slopes	71	IIIe-3	2o1
CoC2	Chili gravelly loam, 6 to 12 percent slopes, moderately eroded	72	IIIe-3	2o1
CpA	Chili silt loam, 0 to 2 percent slopes	72	IIs-1	2o1
CpB	Chili silt loam, 2 to 6 percent slopes	72	IIe-4	2o1
CpC	Chili silt loam, 6 to 12 percent slopes	72	IIIe-3	2o1
CtD	Chili-Oshtemo complex, 12 to 18 percent slopes	72	IVe-3	3s2
CtE	Chili-Oshtemo complex, 18 to 25 percent slopes	72	VIe-2	3s2
CtF	Chili-Oshtemo complex, 25 to 50 percent slopes	72	VIIe-2	3s3
CuB	Chili-Urban land complex, undulating	72	-------	---
CuC	Chili-Urban land complex, rolling	73	-------	---
CwC2	Chili-Wooster complex, 6 to 12 percent slopes, moderately eroded	73	IIIe-3	2o1
CwD2	Chili-Wooster complex, 12 to 18 percent slopes, moderately eroded	73	IVe-3	2r1
CwE	Chili-Wooster complex, 18 to 30 percent slopes	73	VIe-2	2r1
Da	Damascus loam	74	IIIw-3	2w2
DkB	Dekalb channery loam, 2 to 6 percent slopes	75	IIe-3	3o1
DkC	Dekalb channery loam, 6 to 12 percent slopes	75	IIIe-5	3o1
DkD	Dekalb channery loam, 12 to 25 percent slopes	75	VIe-2	3r1
DkF	Dekalb channery loam, 25 to 70 percent slopes	75	VIIe-2	3r2
ElB	Ellsworth silt loam, 2 to 6 percent slopes	76	IIIe-4	3o1
ElB2	Ellsworth silt loam, 2 to 6 percent slopes, moderately eroded	76	IIIe-4	3o1
ElC	Ellsworth silt loam, 6 to 12 percent slopes	76	IVe-1	3o1
ElC2	Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded	76	IVe-1	3o1
ElD2	Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded	76	VIe-1	3r1
ElE2	Ellsworth silt loam, 18 to 40 percent slopes, moderately eroded	76	VIIe-1	3r1
EsB	Ellsworth silt loam, sandstone substratum, 2 to 6 percent slopes	77	IIIe-4	3o1
EuB	Ellsworth-Urban land complex, undulating	77	-------	---
FcA	Fitchville silt loam, 0 to 2 percent slopes	77	IIw-4	2w3
FcB	Fitchville silt loam, 2 to 6 percent slopes	78	IIw-4	2w3
FnA	Fitchville-Urban land complex, nearly level	78	-------	---
Fr	Frenchtown silt loam	79	IIIw-6	2w2
GbB	Geeburg silt loam, 2 to 6 percent slopes	79	IIIe-4	2c1
GbB2	Geeburg silt loam, 2 to 6 percent slopes, moderately eroded	80	IIIe-4	2c1
GbC2	Geeburg silt loam, 6 to 12 percent slopes, moderately eroded	80	IVe-1	2c1
GbD2	Geeburg silt loam, 12 to 18 percent slopes, moderately eroded	80	VIe-1	2c2
GcB	Geeburg-Urban land complex, undulating	80	-------	---
GEF	Geeburg and Glenford silt loams, steep	80	VIIe-1	2c3
GfA	Glenford silt loam, 0 to 2 percent slopes	81	I-1	1o1
GfB	Glenford silt loam, 2 to 6 percent slopes	81	IIe-1	1o1
GfC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded	81	IIIe-1	1o1
GfD2	Glenford silt loam, 12 to 18 percent slopes, moderately eroded	81	IVe-2	1r1

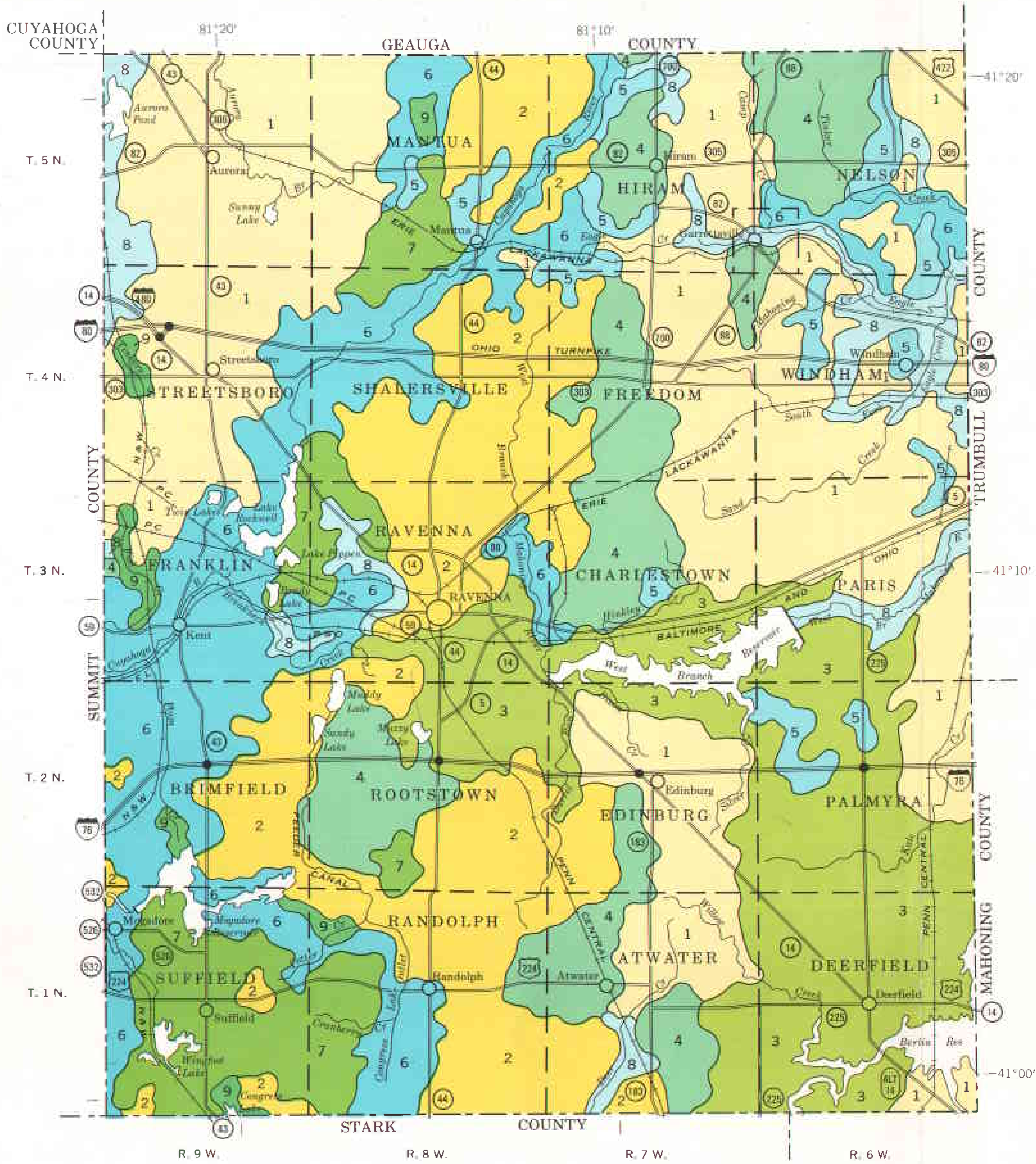
Map symbol	Mapping unit	Page	Capability unit Symbol	Woodland suitability group Symbol
HaB	Haskins loam, 2 to 6 percent slopes	82	IIw-4	2w3
Ho	Holly silt loam	83	IIIw-1	2w2
HrB	Hornell silt loam, 3 to 8 percent slopes	83	IIIw-4	3w1
JtA	Jimtown loam, 0 to 2 percent slopes	84	IIw-4	2w3
JtB	Jimtown loam, 2 to 6 percent slopes	84	IIw-4	2w3
LaB	Lakin loamy sand, 2 to 6 percent slopes	84	IIIs-1	3s1
LaC	Lakin loamy sand, 6 to 12 percent slopes	85	IIIs-1	3s1
Ld	Linwood muck	85	IIIw-2	---
Ln	Lorain silty clay loam	86	IIIw-7	2w1
LoB	Loudonville silt loam, 2 to 6 percent slopes	86	IIe-3	2o1
LoC	Loudonville silt loam, 6 to 12 percent slopes	87	IIIe-5	2o1
LoC2	Loudonville silt loam, 6 to 12 percent slopes, moderately eroded	87	IIIe-5	2o1
LoD2	Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	87	IVe-2	2r1
LoE	Loudonville silt loam, 18 to 25 percent slopes	87	VIe-2	2r1
MgA	Mahoning silt loam, 0 to 2 percent slopes	88	IIIw-4	2w3
MgB	Mahoning silt loam, 2 to 6 percent slopes	88	IIIw-4	2w3
MnB	Mahoning-Urban land complex, undulating	88	-------	---
MtA	Mitiwanga silt loam, 0 to 2 percent slopes	89	IIIw-4	3w1
MtB	Mitiwanga silt loam, 2 to 6 percent slopes	89	IIIw-4	3w1
MvB	Mitiwanga silt loam, moderately well drained variant, 2 to 6 percent slopes	89	IIIe-4	3o1
MvC	Mitiwanga silt loam, moderately well drained variant, 6 to 12 percent slopes	90	IVe-1	3o1
Od	Olmsted loam	90	IIw-5	2w1
Or	Orrville silt loam	91	IIw-2	2w3
OsB	Oshtemo sandy loam, 2 to 6 percent slopes	91	IIIs-1	3s1
OsC	Oshtemo sandy loam, 6 to 12 percent slopes	91	IIIe-3	3s1
ReA	Ravenna silt loam, 0 to 2 percent slopes	92	IIw-3	2w3
ReB	Ravenna silt loam, 2 to 6 percent slopes	92	IIw-3	2w3
RmA	Remsen silt loam, 0 to 2 percent slopes	93	IIIw-4	2w3
RmB	Remsen silt loam, 2 to 6 percent slopes	93	IIIw-4	2w3
RsB	Rittman silt loam, 2 to 6 percent slopes	94	IIe-2	1o1
RsC	Rittman silt loam, 6 to 12 percent slopes	94	IIIe-2	1o1
RsC2	Rittman silt loam, 6 to 12 percent slopes, moderately eroded	94	IIIe-2	1o1
RsD2	Rittman silt loam, 12 to 18 percent slopes, moderately eroded	95	IVe-4	1r1
RsE2	Rittman silt loam, 18 to 25 percent slopes, moderately eroded	95	VIe-1	1r1
Sb	Sebring silt loam	95	IIIw-3	2w2
Sv	Sebring silt loam, dark surface variant	96	IIw-5	2w1
Tg	Tioga loam	96	IIw-1	1o1
TrA	Trumbull silt loam, 0 to 2 percent slopes	97	IVw-1	2w2
TUB	Typic Udorthents, strip mined, undulating	97	-------	---
TUD	Typic Udorthents, strip mined, hilly	97	-------	---
Ur	Urban land	98	-------	---
WaA	Wadsworth silt loam, 0 to 2 percent slopes	99	IIIw-5	2w3
WaB	Wadsworth silt loam, 2 to 6 percent slopes	99	IIIw-5	2w3
Wc	Wallkill silt loam	99	IIIw-1	2w1
WhA	Wheeling silt loam, 0 to 2 percent slopes	100	I-1	1o1
WhB	Wheeling silt loam, 2 to 6 percent slopes	100	IIe-1	1o1
WuB	Wooster silt loam, 2 to 6 percent slopes	101	IIe-1	1o1
WuC	Wooster silt loam, 6 to 12 percent slopes	101	IIIe-1	1o1
WuC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded	101	IIIe-1	1o1
WuD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded	101	IVe-2	1r1
WuE2	Wooster silt loam, 18 to 50 percent slopes, moderately eroded	101	VIe-2	1r2

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978— 224-458/92

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF LANDS AND SOIL
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

GENERAL SOIL MAP
PORTAGE COUNTY, OHIO

1 0 1 2 3 4 Miles

SOIL ASSOCIATIONS

SOILS THAT FORMED MOSTLY IN GLACIAL TILL ON UPLANDS

1 Mahoning-Ellsworth association: Nearly level to sloping, somewhat poorly drained and moderately well drained soils that formed mostly in moderately fine textured glacial till

2 Canfield-Ravenna-Wooster association: Nearly level to sloping, somewhat poorly drained to well drained soils that formed in medium textured glacial till and that have a fragipan

3 Remsen-Geeburg-Trumbull association: Nearly level to gently sloping, moderately well drained to poorly drained soils that formed in fine textured glacial till

4 Wadsworth-Rittman association: Nearly level to sloping, somewhat poorly drained and moderately well drained soils that formed in moderately fine textured glacial till and that have a fragipan

5 Loudonville-Mitiwanga-Dekalb association: Gently sloping to steep, well drained and somewhat poorly drained soils that formed in moderately thick glacial till over bedrock and in residuum from sandstone

SOILS THAT FORMED MOSTLY IN GLACIAL OUTWASH ON TERRACES

6 Chili association: Nearly level to sloping, well drained soils that formed in loamy material overlying sand and gravel

7 Chili-Oshtemo-Wooster association: Sloping to very steep, well drained soils that formed in sandy or loamy material overlying sand or gravel or both and sloping to very steep, well drained soils that formed in loamy glacial till and that have a fragipan

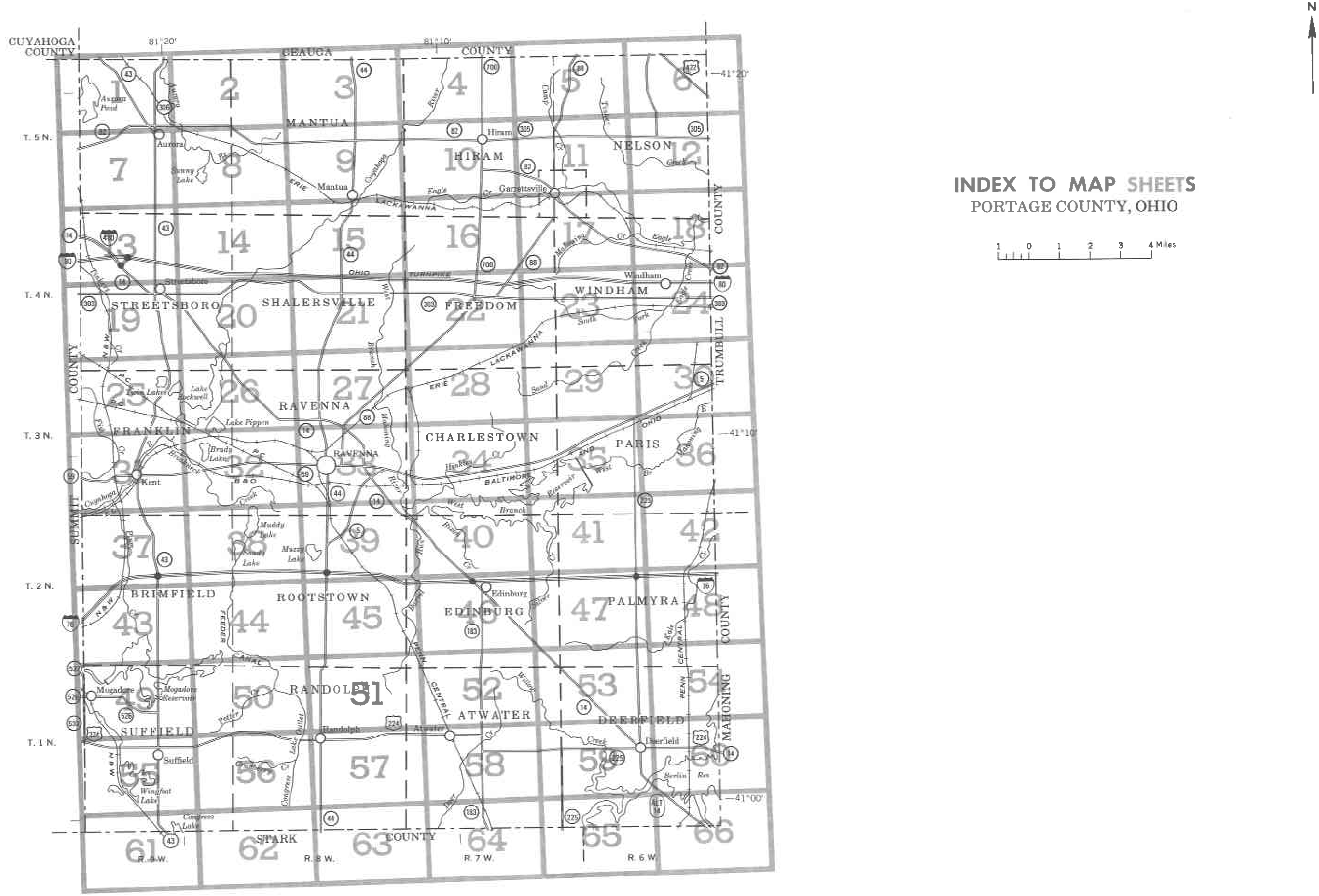
SOILS THAT FORMED IN LACUSTRINE, ALLUVIAL, OR ORGANIC DEPOSITS ON TERRACES, FLOOD PLAINS, AND GLACIAL UPLANDS

8 Sebring-Holly-Caneadea association: Nearly level to gently sloping, poorly drained and somewhat poorly drained soils that formed in lacustrine material in post-glacial lake basins and in alluvial material on flood plains

9 Carlisle association: Depressional to level, very poorly drained soils that formed in organic material

Compiled 1977

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
PORTAGE COUNTY, OHIO

1 0 1 2 3 4 Miles

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is a capital letter if the unit is broadly defined; otherwise it is a small letter. The third letter, A, B, C, D, E, or F, is for soil slope. Most symbols without a slope letter are for nearly level soils, but one is for a miscellaneous land type. A final number, 2, in a symbol means that the soil is moderately eroded.

SYMBOL	NAME
BgA	Bogart silt loam, 0 to 2 percent slopes
BgB	Bogart silt loam, 2 to 6 percent slopes
BhB	Bogart-Haskins complex, 2 to 6 percent slopes
Ca	Canadice silt loam
CcA	Caneadea silt loam, 0 to 2 percent slopes
CcB	Caneadea silt loam, 2 to 6 percent slopes
CdA	Canfield silt loam, 0 to 2 percent slopes
CdB	Canfield silt loam, 2 to 6 percent slopes
CdC	Canfield silt loam, 6 to 12 percent slopes
CdC2	Canfield silt loam, 6 to 12 percent slopes, moderately eroded
CfB	Canfield-Urban land complex, undulating
CfC	Canfield-Urban land complex, rolling
Cg	Carlisle muck
CnA	Chili loam, 0 to 2 percent slopes
CnB	Chili loam, 2 to 6 percent slopes
CnC	Chili loam, 6 to 12 percent slopes
CoC2	Chili gravelly loam, 6 to 12 percent slopes, moderately eroded
CpA	Chili silt loam, 0 to 2 percent slopes
CpB	Chili silt loam, 2 to 6 percent slopes
CpC	Chili silt loam, 6 to 12 percent slopes
CtD	Chili-Oshtemo complex, 12 to 18 percent slopes
CtE	Chili-Oshtemo complex, 18 to 25 percent slopes
CtF	Chili-Oshtemo complex, 25 to 50 percent slopes
CuB	Chili-Urban land complex, undulating
CuC	Chili-Urban land complex, rolling
CwC2	Chili-Wooster complex, 6 to 12 percent slopes, moderately eroded
CwD2	Chili-Wooster complex, 12 to 18 percent slopes, moderately eroded
CwE	Chili-Wooster complex, 18 to 30 percent slopes
Da	Damascus loam
DkB	Dekalb channery loam, 2 to 6 percent slopes
DkC	Dekalb channery loam, 6 to 12 percent slopes
DkD	Dekalb channery loam, 12 to 25 percent slopes
DkF	Dekalb channery loam, 25 to 70 percent slopes
ElB	Ellsworth silt loam, 2 to 6 percent slopes
ElB2	Ellsworth silt loam, 2 to 6 percent slopes, moderately eroded
ElC	Ellsworth silt loam, 6 to 12 percent slopes
ElC2	Ellsworth silt loam, 6 to 12 percent slopes, moderately eroded
ElD2	Ellsworth silt loam, 12 to 18 percent slopes, moderately eroded
ElE2	Ellsworth silt loam, 18 to 40 percent slopes, moderately eroded
EsB	Ellsworth silt loam, sandstone substratum, 2 to 6 percent slopes
EuB	Ellsworth-Urban land complex, undulating
FcA	Fitchville silt loam, 0 to 2 percent slopes
FcB	Fitchville silt loam, 2 to 6 percent slopes
FnA	Fitchville-Urban land complex, nearly level
Fr	Frenchtown silt loam
GbB	Geeburg silt loam, 2 to 6 percent slopes
GbB2	Geeburg silt loam, 2 to 6 percent slopes, moderately eroded
GbC2	Geeburg silt loam, 6 to 12 percent slopes, moderately eroded
GbD2	Geeburg silt loam, 12 to 18 percent slopes, moderately eroded
GcB	Geeburg-Urban land complex, undulating
GEF	Geeburg and Glenford silt loams, steep *
GfA	Glenford silt loam, 0 to 2 percent slopes
GfB	Glenford silt loam, 2 to 6 percent slopes
GfC2	Glenford silt loam, 6 to 12 percent slopes, moderately eroded
GfD2	Glenford silt loam, 12 to 18 percent slopes, moderately eroded
HaB	Haskins loam, 2 to 6 percent slopes
Ho	Holly silt loam
HrB	Hornell silt loam, 3 to 8 percent slopes
JtA	Jimtown loam, 0 to 2 percent slopes
JtB	Jimtown loam, 2 to 6 percent slopes
LaB	Lakin loamy sand, 2 to 6 percent slopes
LaC	Lakin loamy sand, 6 to 12 percent slopes
Ld	Linwood muck
Ln	Lorain silty clay loam
LoB	Loudonville silt loam, 2 to 6 percent slopes
LoC	Loudonville silt loam, 6 to 12 percent slopes
LoC2	Loudonville silt loam, 6 to 12 percent slopes, moderately eroded
LoD2	Loudonville silt loam, 12 to 18 percent slopes, moderately eroded
LoE	Loudonville silt loam, 18 to 25 percent slopes
MgA	Mahoning silt loam, 0 to 2 percent slopes
MgB	Mahoning silt loam, 2 to 6 percent slopes
MnB	Mahoning-Urban land complex, undulating
MtA	Mitiwanga silt loam, 0 to 2 percent slopes
MtB	Mitiwanga silt loam, 2 to 6 percent slopes
MvB	Mitiwanga silt loam, moderately well drained variant, 2 to 6 percent slopes
MvC	Mitiwanga silt loam, moderately well drained variant, 6 to 12 percent slopes
Od	Olmsted loam
Or	Orrville silt loam
OsB	Oshtemo sandy loam, 2 to 6 percent slopes
OsC	Oshtemo sandy loam, 6 to 12 percent slopes
ReA	Ravenna silt loam, 0 to 2 percent slopes
ReB	Ravenna silt loam, 2 to 6 percent slopes
RmA	Remsen silt loam, 0 to 2 percent slopes
RmB	Remsen silt loam, 2 to 6 percent slopes
RsB	Rittman silt loam, 2 to 6 percent slopes
RsC	Rittman silt loam, 6 to 12 percent slopes
RsC2	Rittman silt loam, 6 to 12 percent slopes, moderately eroded
RsD2	Rittman silt loam, 12 to 18 percent slopes, moderately eroded
RsE2	Rittman silt loam, 18 to 25 percent slopes, moderately eroded
Sb	Sebring silt loam
Sv	Sebring silt loam, dark surface variant
Tg	Tioga loam
TrA	Trumbull silt loam, 0 to 2 percent slopes
TUB	Typic Udorthents, strip mined, undulating *
TUD	Typic Udorthents, strip mined, hilly *
Ur	Urban land
WaA	Wadsworth silt loam, 0 to 2 percent slopes
WaB	Wadsworth silt loam, 2 to 6 percent slopes
Wc	Wallkill silt loam
WhA	Wheeling silt loam, 0 to 2 percent slopes
WhB	Wheeling silt loam, 2 to 6 percent slopes
WuB	Wooster silt loam, 2 to 6 percent slopes
WuC	Wooster silt loam, 6 to 12 percent slopes
WuC2	Wooster silt loam, 6 to 12 percent slopes, moderately eroded
WuD2	Wooster silt loam, 12 to 18 percent slopes, moderately eroded
WuE2	Wooster silt loam, 18 to 50 percent slopes, moderately eroded

* The composition of these units is more variable than that of the others in the survey area but has been controlled well enough for interpretations to be made for the expected uses of the soils.

PORTAGE COUNTY, OHIO

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 79
- Federal — 410
- State or county — 52
- County, farm or ranch — 378

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water; w

PITS

- Gravel pit — G.P.
- Mine or quarry — QU.

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — GAS
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water; w
- Intermittent — Int; i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CeA; FoB2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

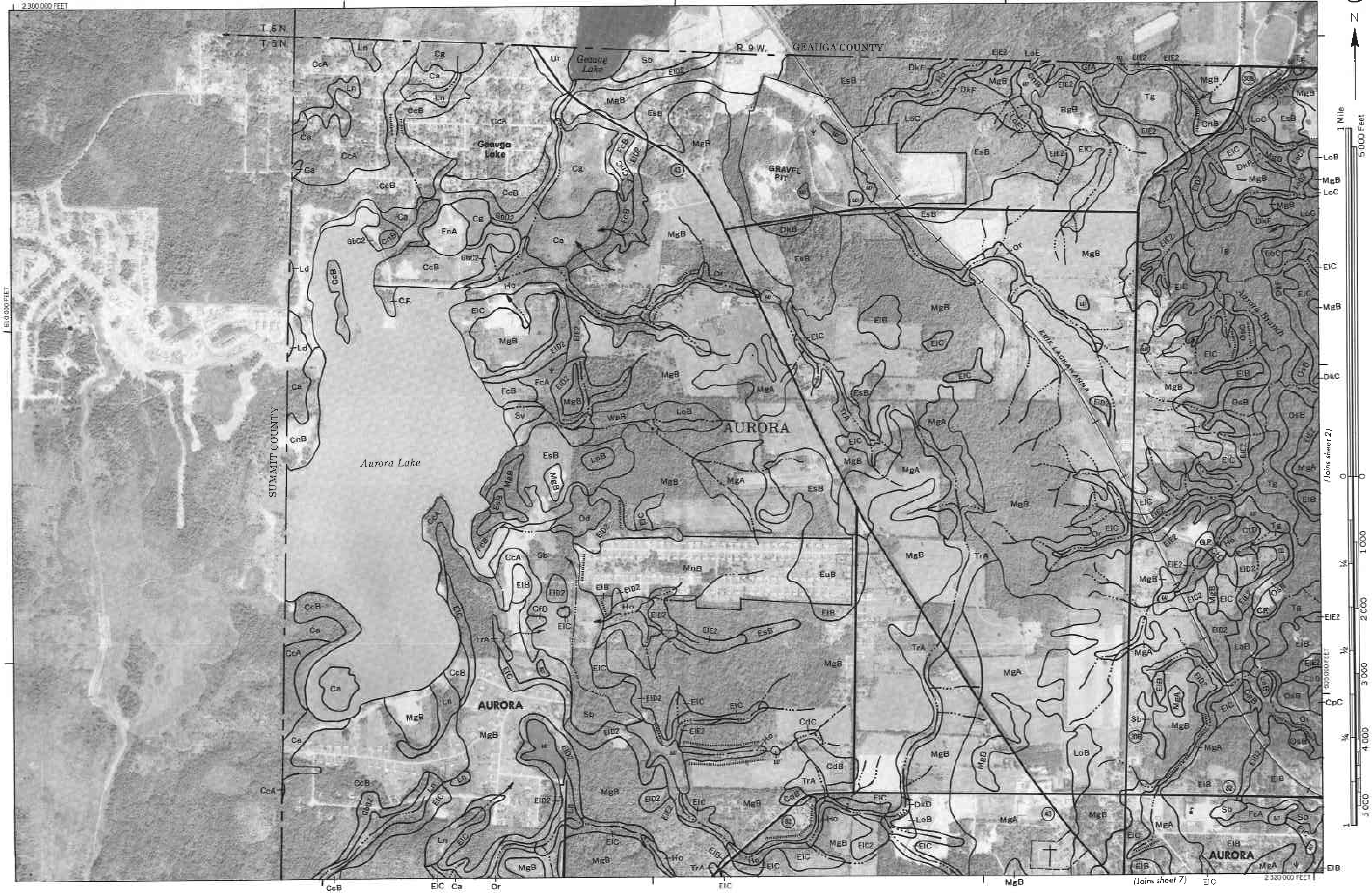
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Cut and fill — C.F.
- **Made land** — M.L.



PORTAGE COUNTY, OHIO NO. 1

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1978 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 2

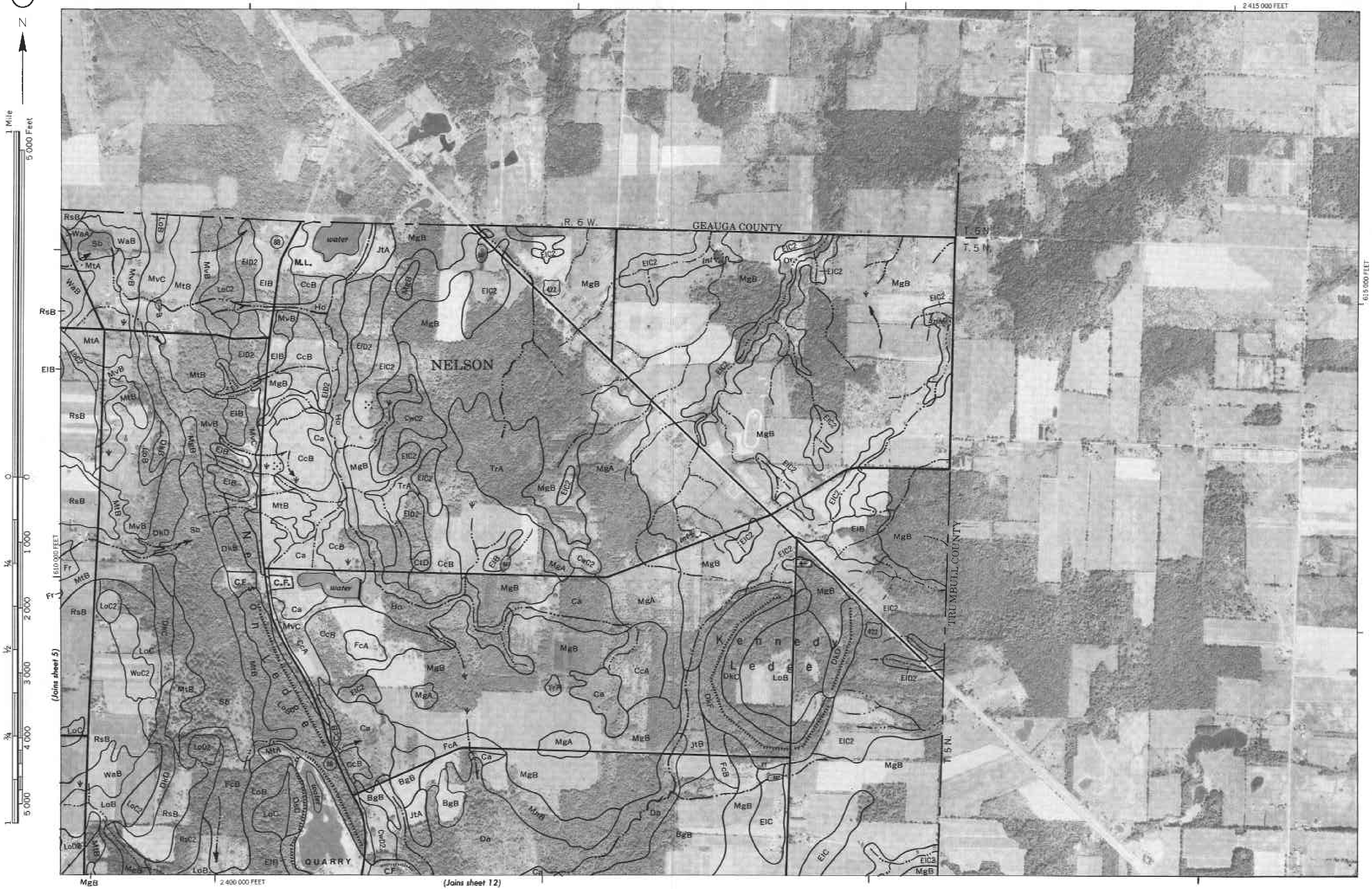
(3)

PORTAGE COUNTY, OHIO NO. 3

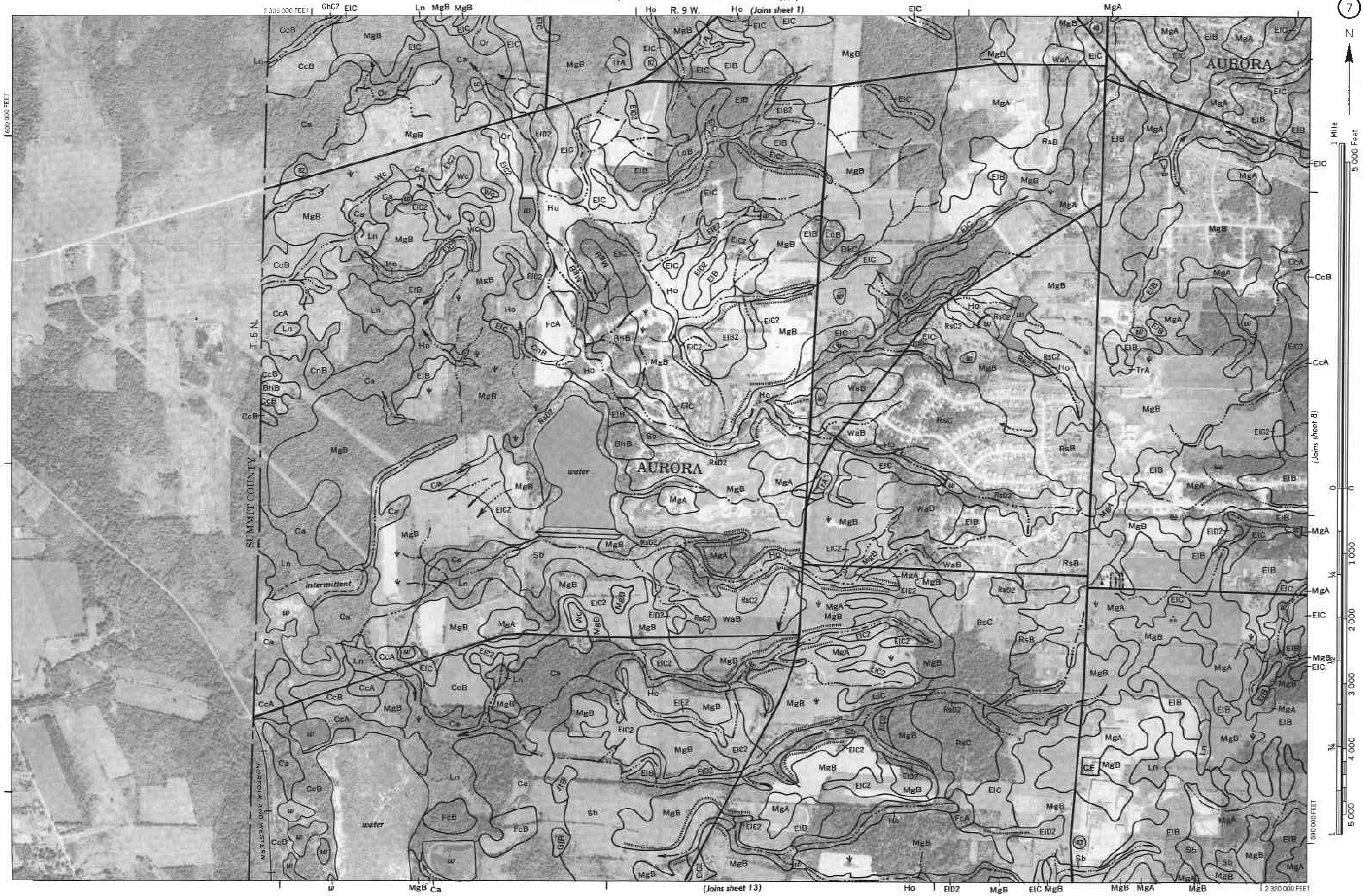
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
1 Mile
5 000 Feet
2 375 000 FEET
615 000 FEET
605 000 FEET
2 360 000 FEET
R. 8 W.
R. 7 W.
T. 6 N.
T. 5 N.
GEAUGA COUNTY
MANTUA
Hiram Rapids
HIRAM
CUYAHOGA
RIVER
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 10)


5
N
GEAUGA COUNTY
HIRAM
NELSON
Tinker Creek
T. 6 N.
T. 5 N.
R. 7 W. | R. 6 W.
2 380 000 FEET
2 395 000 FEET
610 000 FEET
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 11)
1 Mile
5 000 Feet
PORTAGE COUNTY, OHIO NO. 5
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



PORTAGE COUNTY, OHIO NO. 6

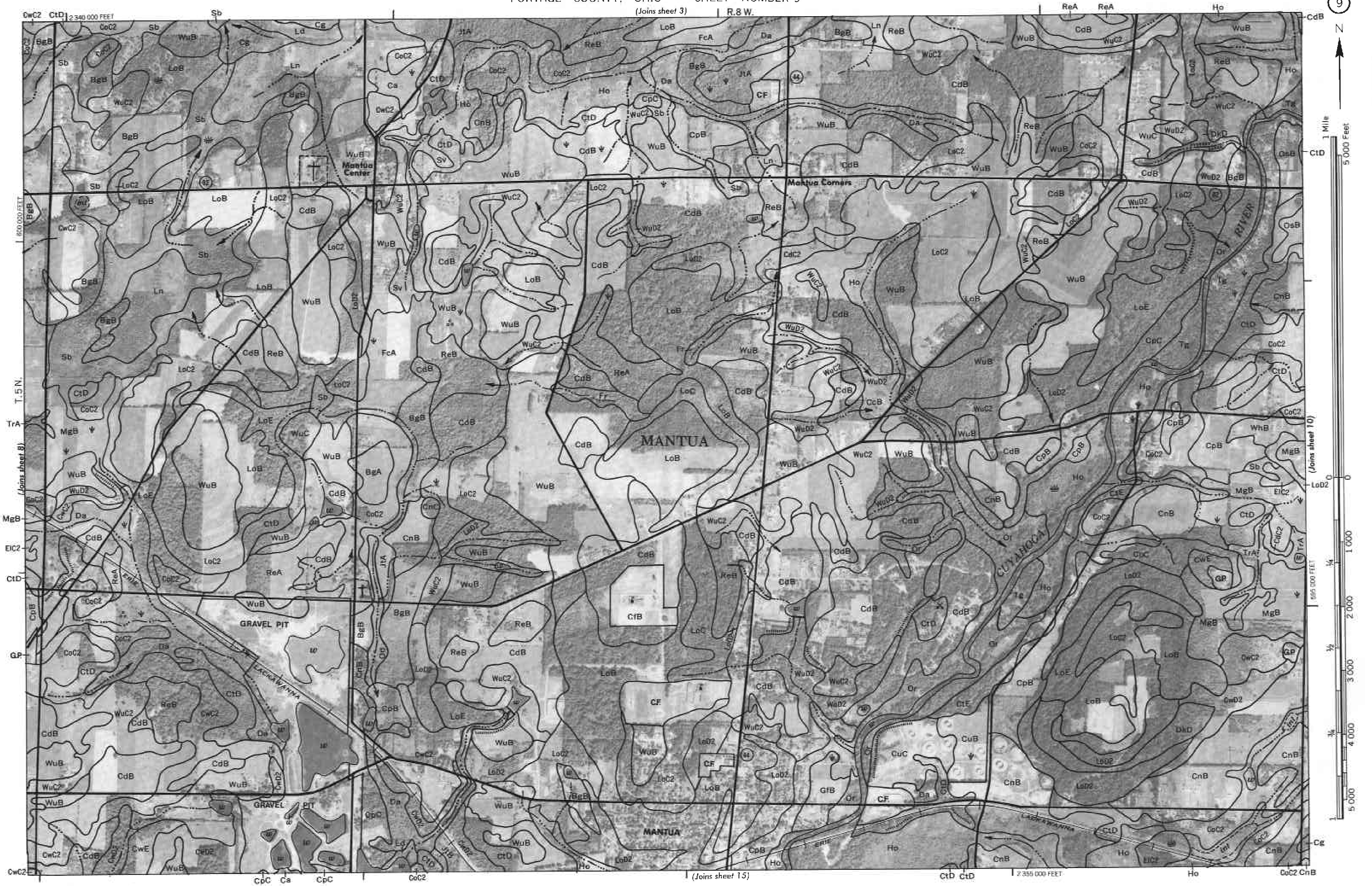


PORTAGE COUNTY, OHIO NO. 7

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO — SHEET NUMBER 8

PORTAGE COUNTY, OHIO NO. 8



PORTAGE COUNTY, OHIO NO. 9

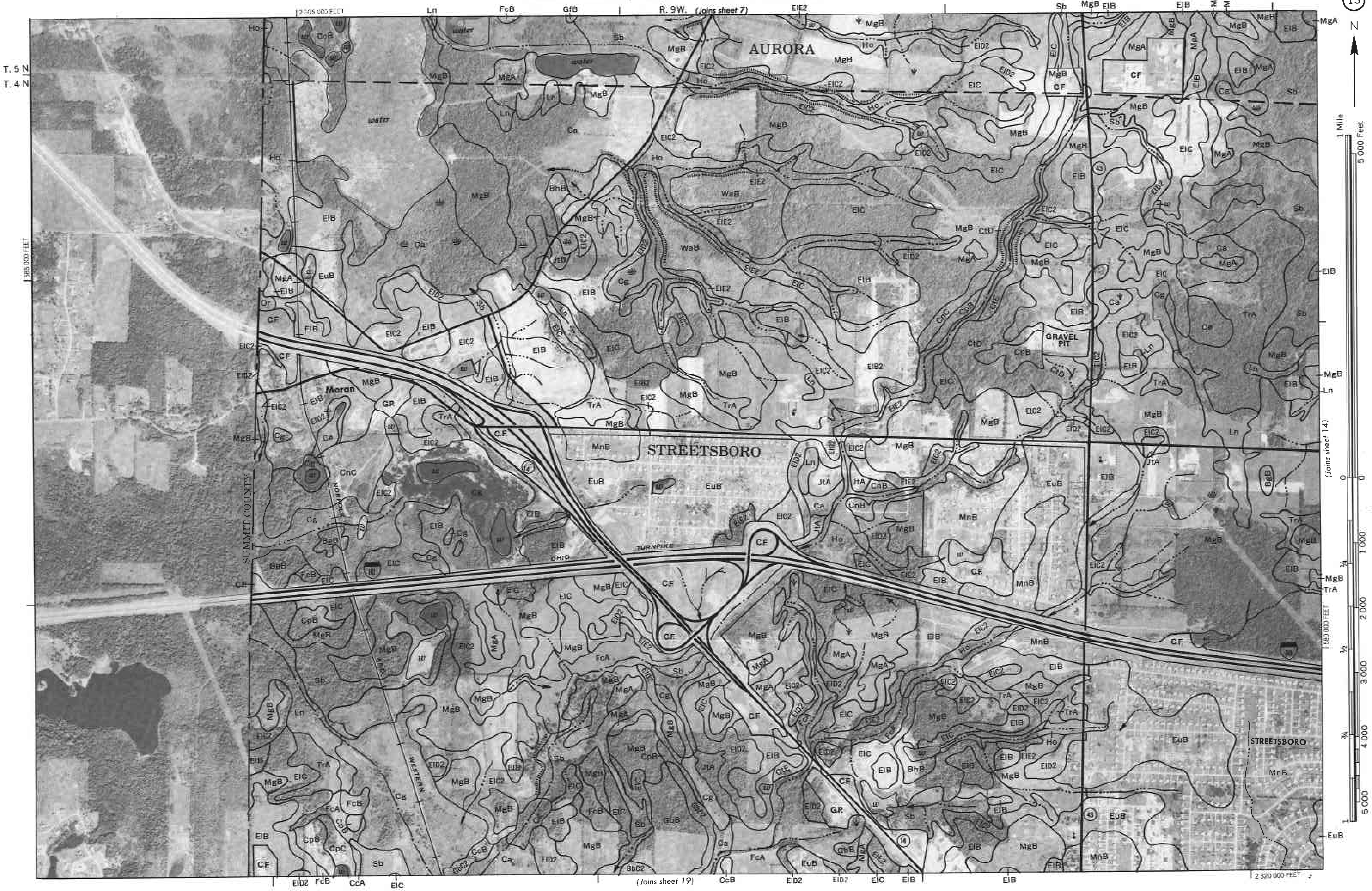
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 10

PORTAGE COUNTY, OHIO NO. 11

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

12
N
1 Mile
5 000 Feet
(Joins sheet 6)
R.6W.
2 415 000 FEET
605 000 FEET
QUARRY
C.F.
Nelson
NELSON
TRUMBULL COUNTY
T.5N.
(Joins sheet 11)
Tinker Creek
595 000 FEET
2 400 000 FEET
(Joins sheet 18)
PORTAGE COUNTY, OHIO NO. 12



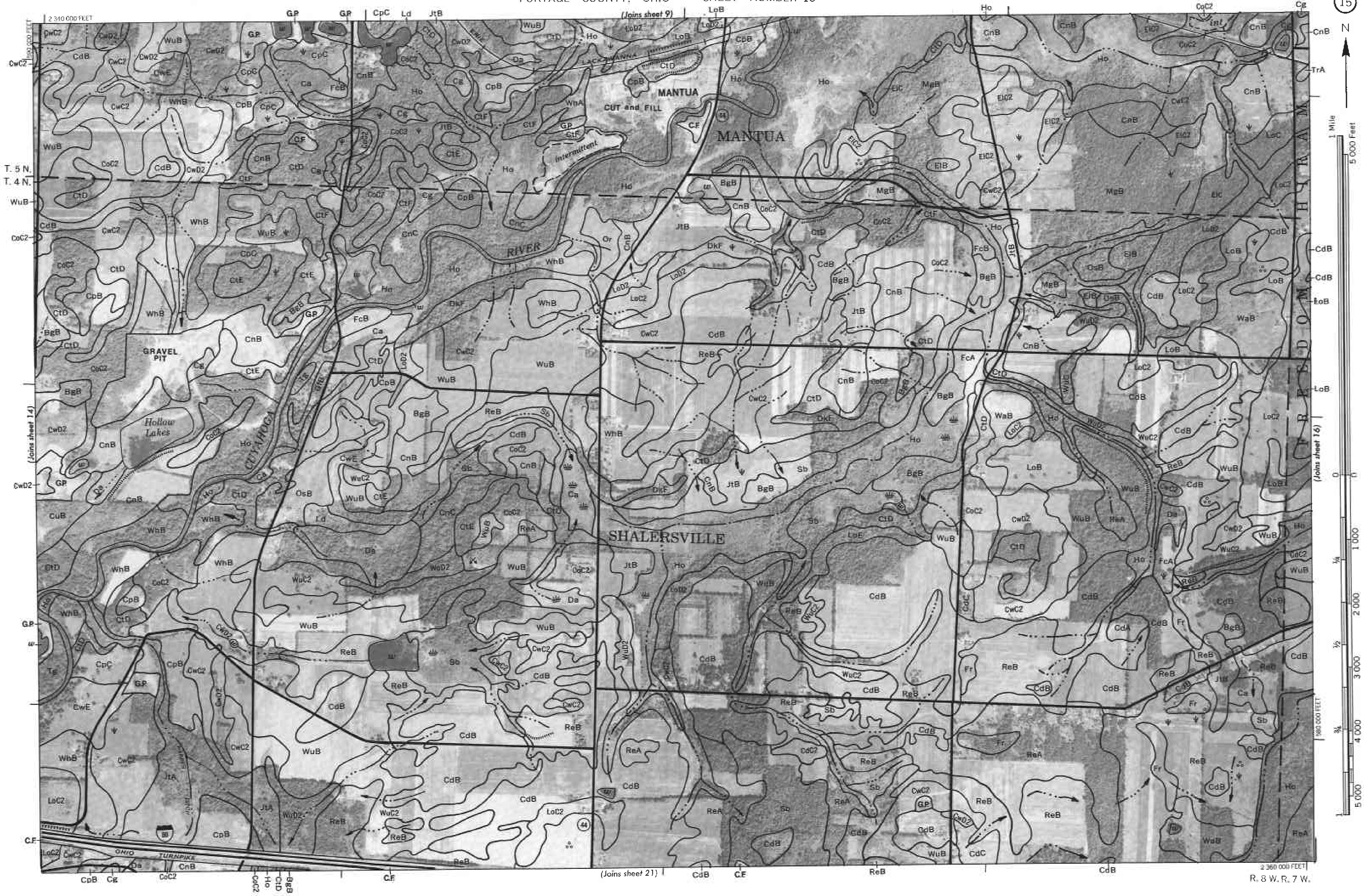
PORTAGE COUNTY, OHIO NO. 13

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO — SHEET NUMBER 14

This map is compiled on [illegible] aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 14

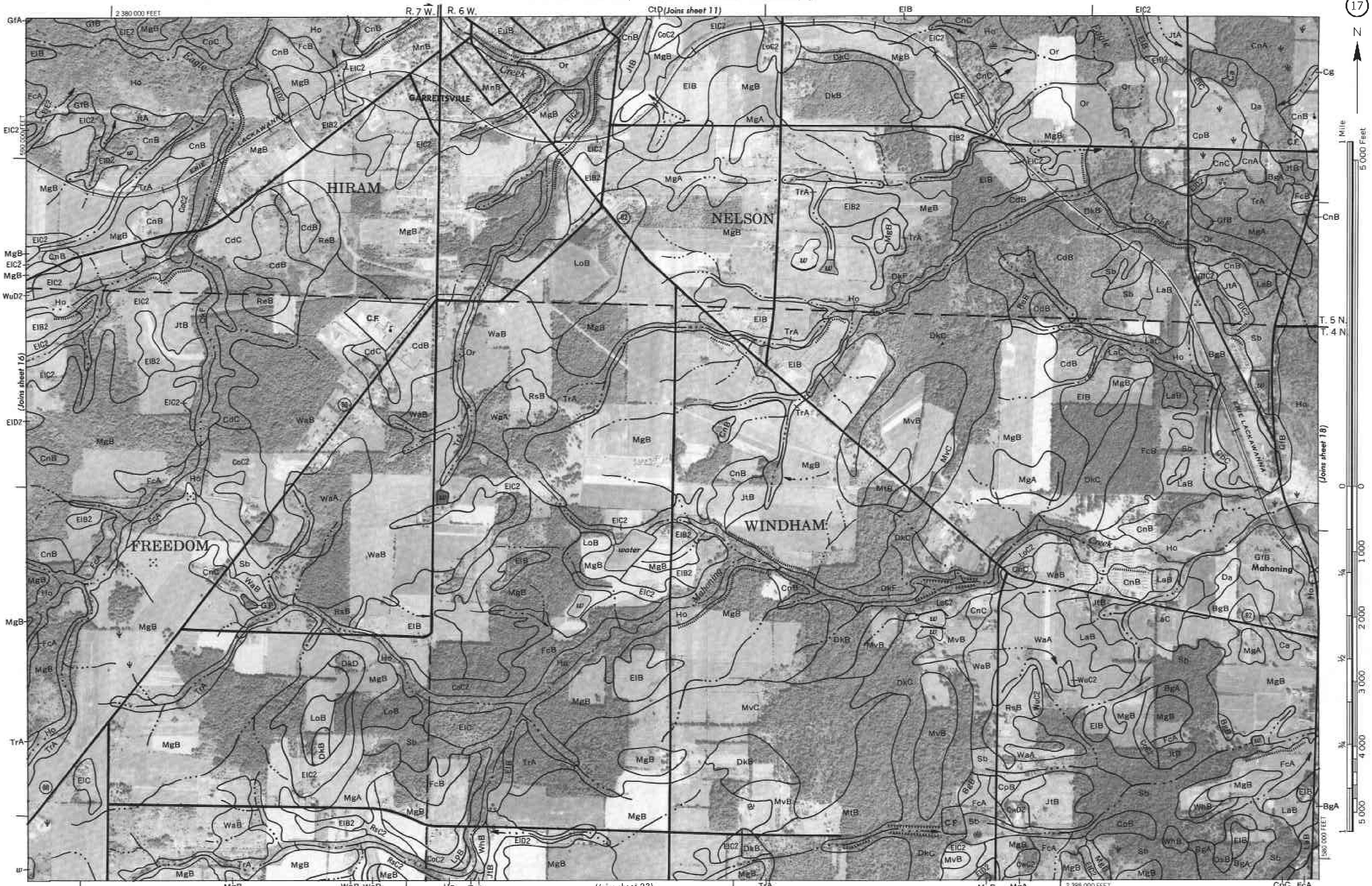


PORTAGE COUNTY, OHIO NO. 15

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

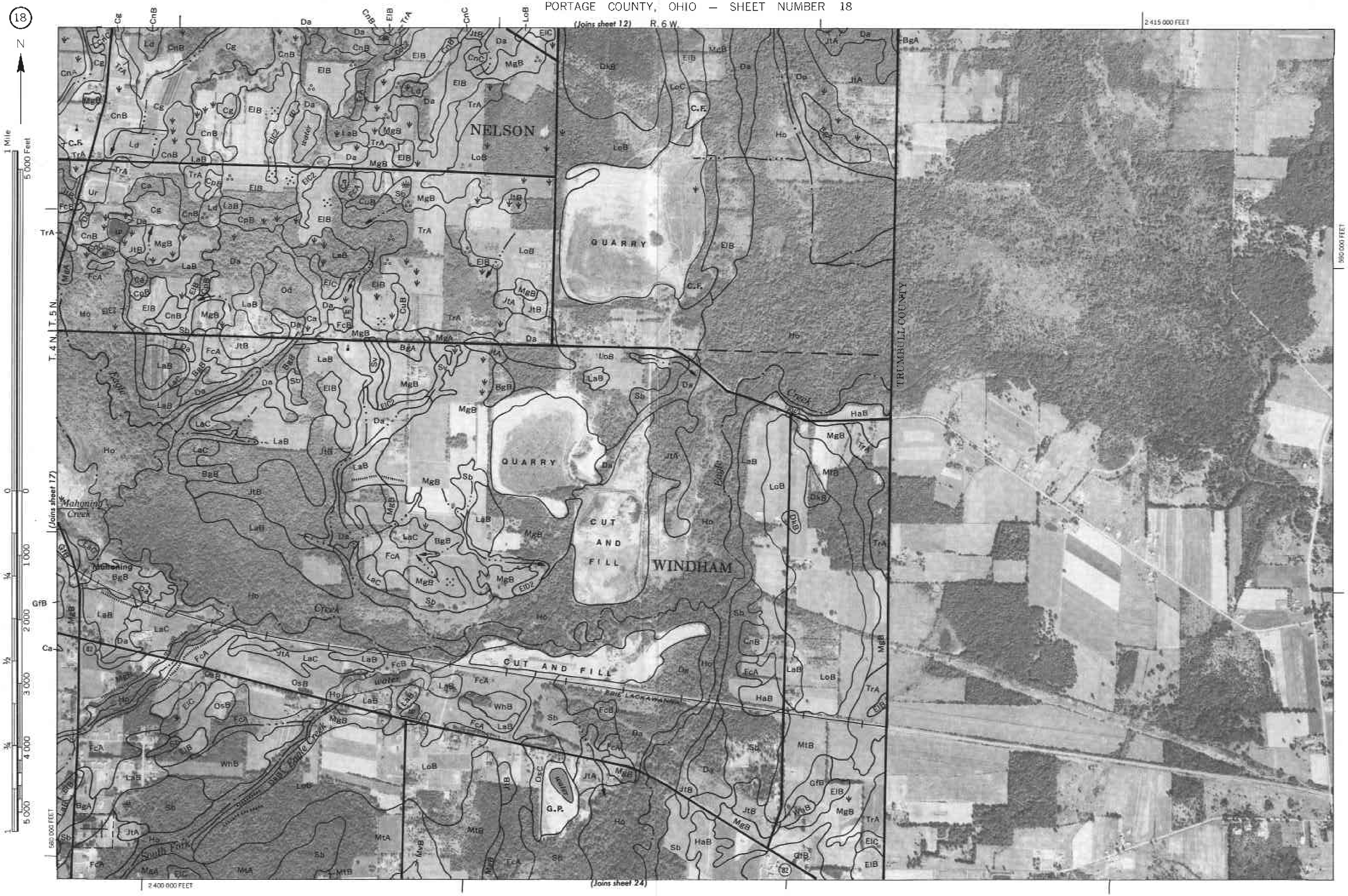
PORTAGE COUNTY, OHIO — SHEET NUMBER 16

PORTAGE COUNTY, OHIO NO. 16



PORTAGE COUNTY, OHIO NO. 17

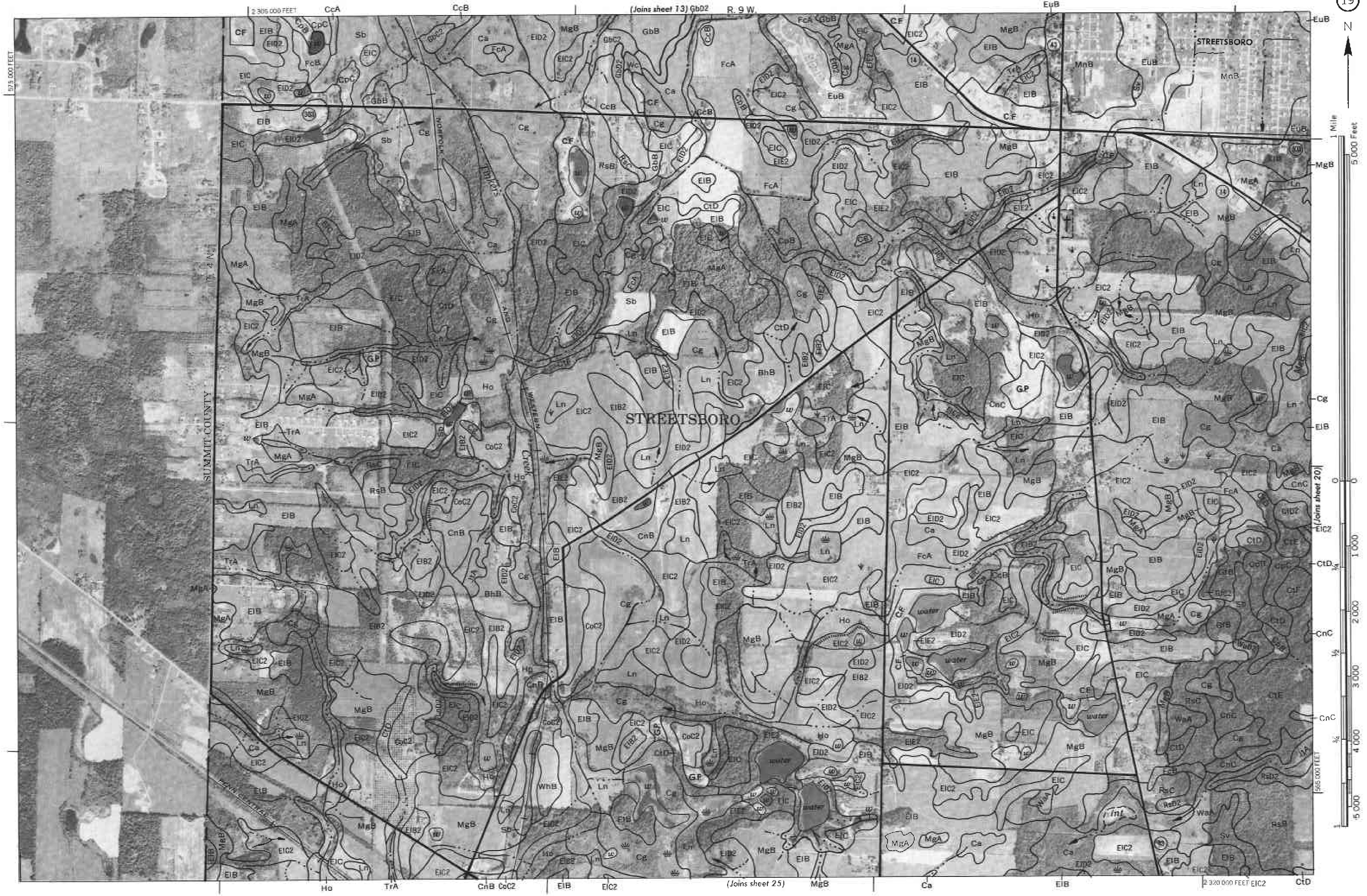
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO — SHEET NUMBER 19

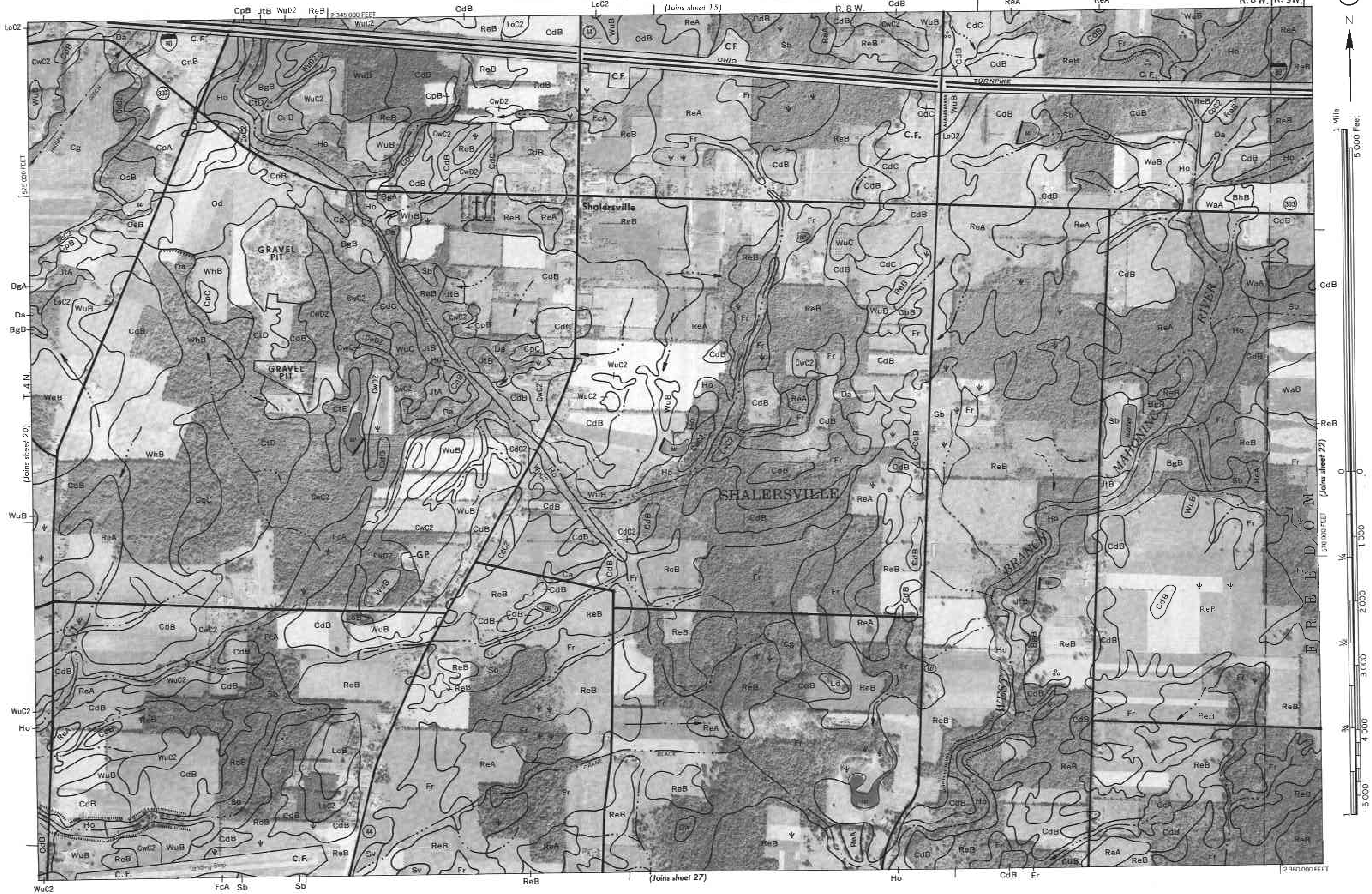
(19)



PORTAGE COUNTY, OHIO NO. 19

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 20


(Joins sheet 15)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 27)
R. 8 W.
R. 9 W.
T. 4 N.
OHIO TURNPIKE
Shalersville
SHALERSVILLE
GRAVEL PIT
GRAVEL PIT
MAHONING RIVER
WEST BRANCH
FREEDOM
C.F.
N
1 Mile
5 000 Feet
2 345 000 FEET
2 360 000 FEET
570 000 FEET
575 000 FEET

(22)

PORTAGE COUNTY, OHIO — SHEET NUMBER 22

(Joins sheet 16)

R. 7 W.

2 375 000 FEET

N

1 Mile
5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

570 000 Feet

575 000 FEET

(Joins sheet 21)

(Joins sheet 23)

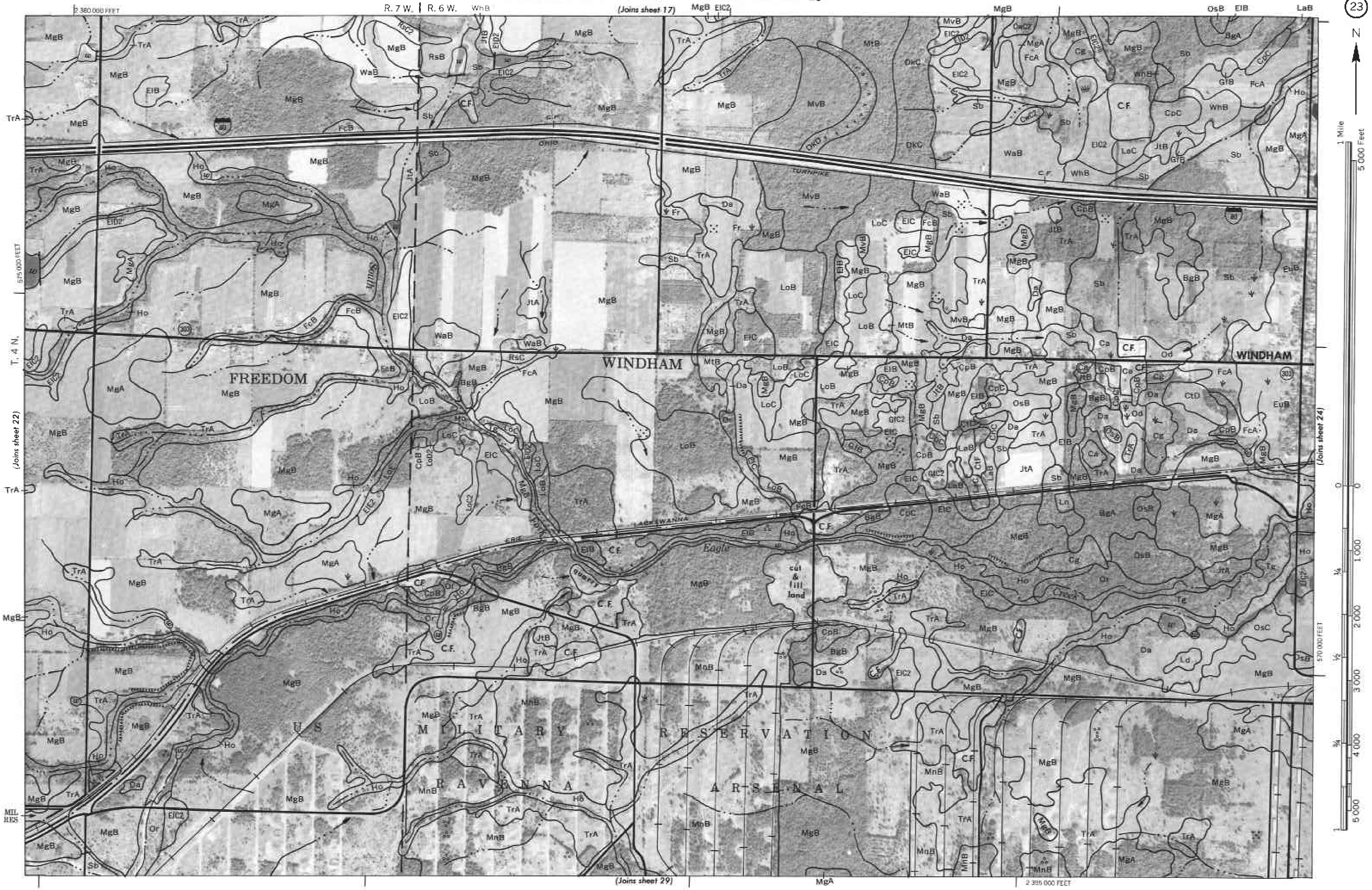
T. 4 N.

(Joins sheet 28)

2 365 000 FEET

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 22

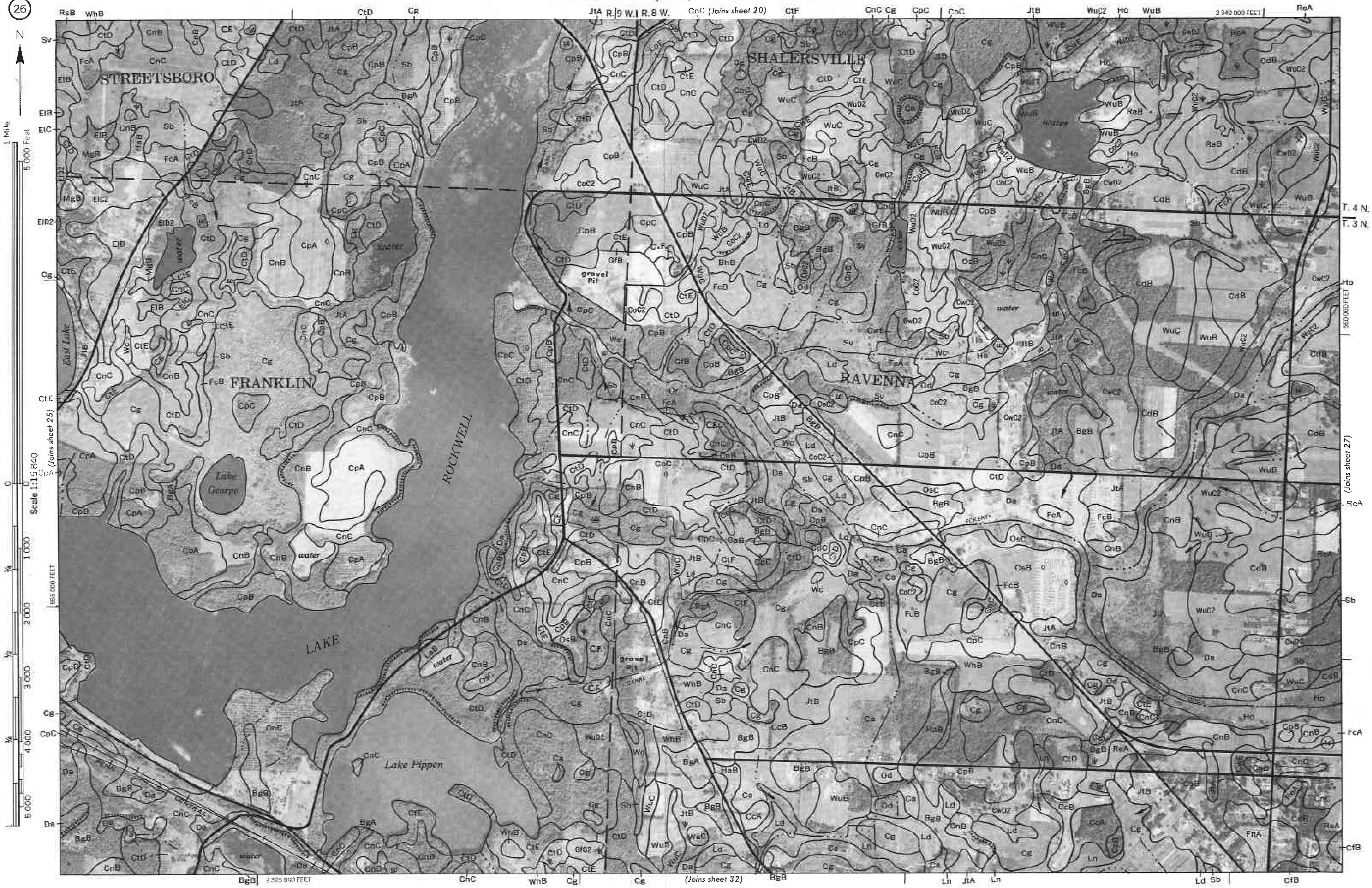


PORTAGE COUNTY, OHIO NO. 23

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


24
N
(Joins sheet 18)
(Joins sheet 23)
(Joins sheet 30)
R. 6 W.
T. 4 N.
WINDHAM
OHIO
TURNPIKE
ERIE
LACKAWANNA
U S MILITARY RESERVATION
RAVENNA ARSENAL
TRUMBULL COUNTY
1 Mile
5 000 Feet
2 415 000 FEET
2 400 000 FEET
570 000 FEET
580 000 FEET
PORTAGE COUNTY, OHIO NO. 24

(Joins sheet 19)



This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 27

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


(Joins sheet 23)
R. 7 W. | R. 6 W.
2 380 000 FEET
565 000 FEET
FREEDOM
WINDHAM
U S MILITARY RESERVATION
CHARLESTOWN
PARIS
RAVENNA ARSENAL
QUARRY
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 35)
T. 3 N. | T. 4 N.
N
1 Mile
5 000 Feet
2 400 000 FEET
535 000 FEET

PORTAGE COUNTY, OHIO — SHEET NUMBER 30

PORTAGE COUNTY, OHIO — SHEET NUMBER 31

PORTAGE COUNTY, OHIO NO. 31

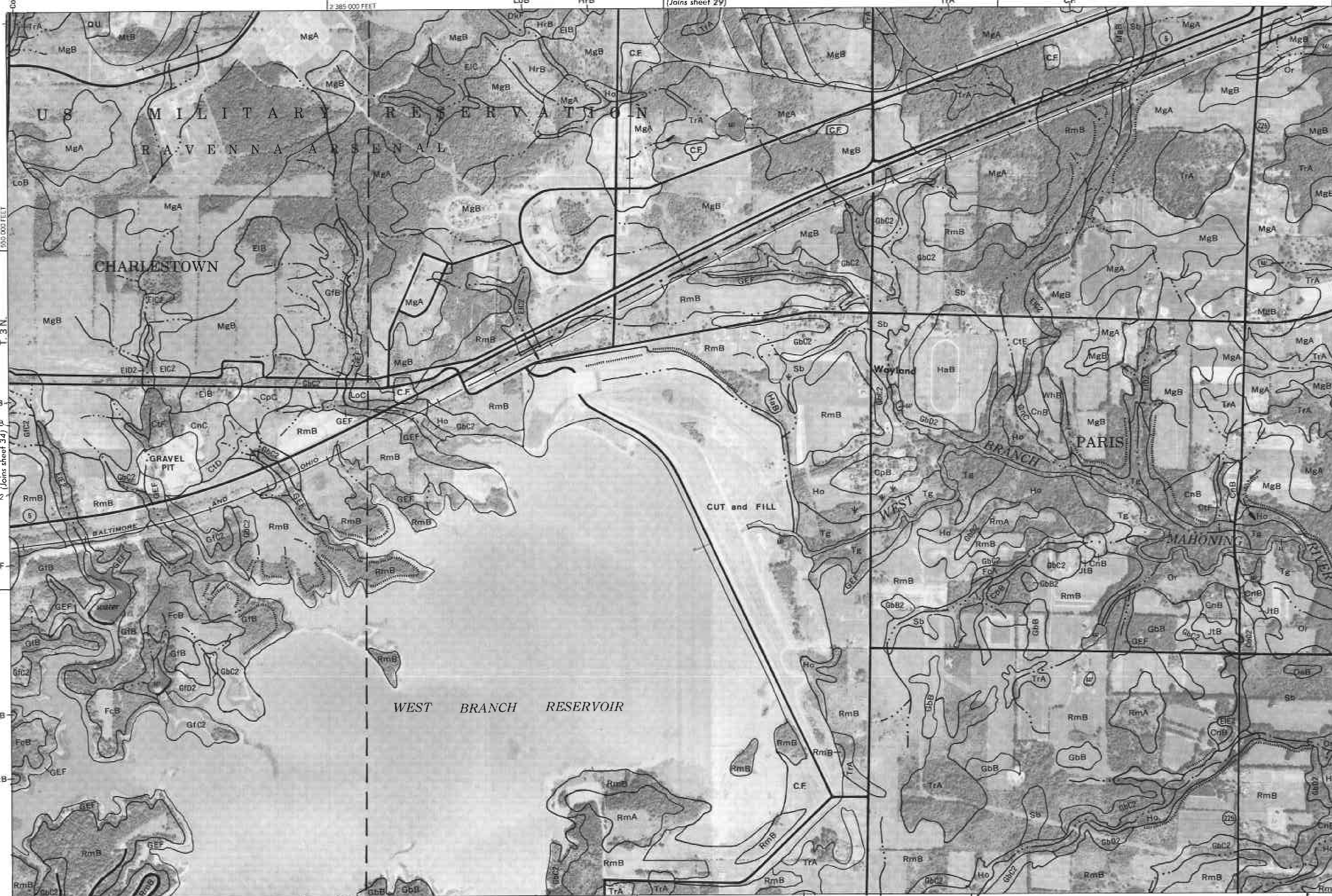
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 32

PORTAGE COUNTY, OHIO NO. 33

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


34
N
R. 7 W.
(Joins sheet 28)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 40)
T. 3 N.
US MILITARY RESERVATION
RAVENNA ARSENAL
CHARLESTOWN
Charlestown
Augerburg
Hinkley Creek
WEST BRANCH RESERVOIR
GRAVEL PIT
BALTIMORE AND OHIO
2 380 000 FEET
2 365 000 FEET
540 000 FEET
560 000 FEET
1 Mile
5 000 Feet
PORTAGE COUNTY, OHIO NO. 34



(Joins sheet 29)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 41)
U S MILITARY RESERVATION
RAVENNA ARSENAL
CHARLESTOWN
GRAVEL PIT
CUT and FILL
WEST BRANCH RESERVOIR
Wayland
PARIS
WEST BRANCH MAHONING RIVER
BALTIMORE AND OHIO
T. 3 N.
R. 7 W. R. 6 W.
2 385 000 FEET
2 400 000 FEET
550 000 FEET
545 000 FEET
N
1 Mile
5 000 Feet

PORTAGE COUNTY, OHIO — SHEET NUMBER 36

PORTAGE COUNTY, OHIO NO. 36

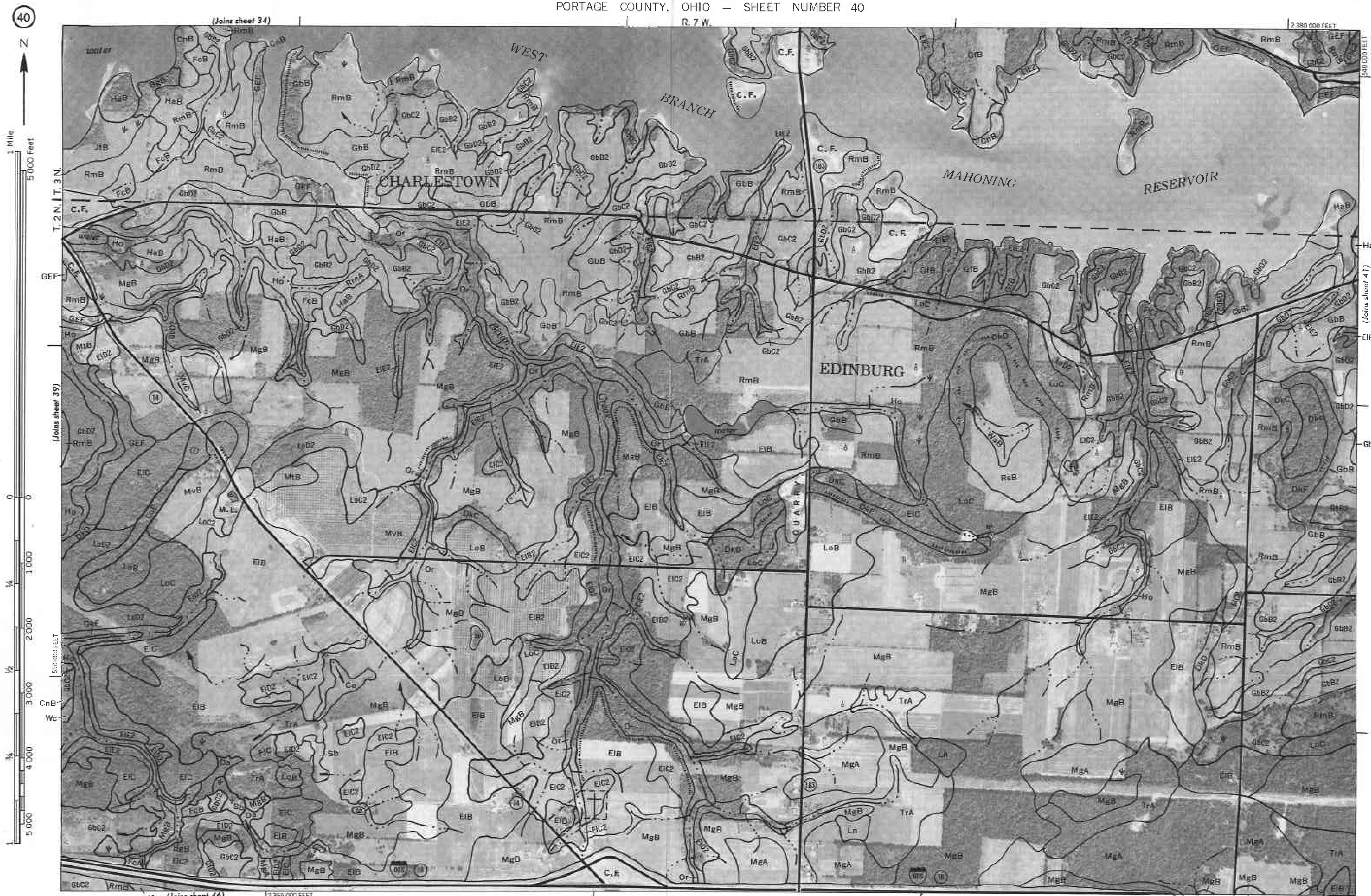
PORTAGE COUNTY, OHIO NO. 37

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

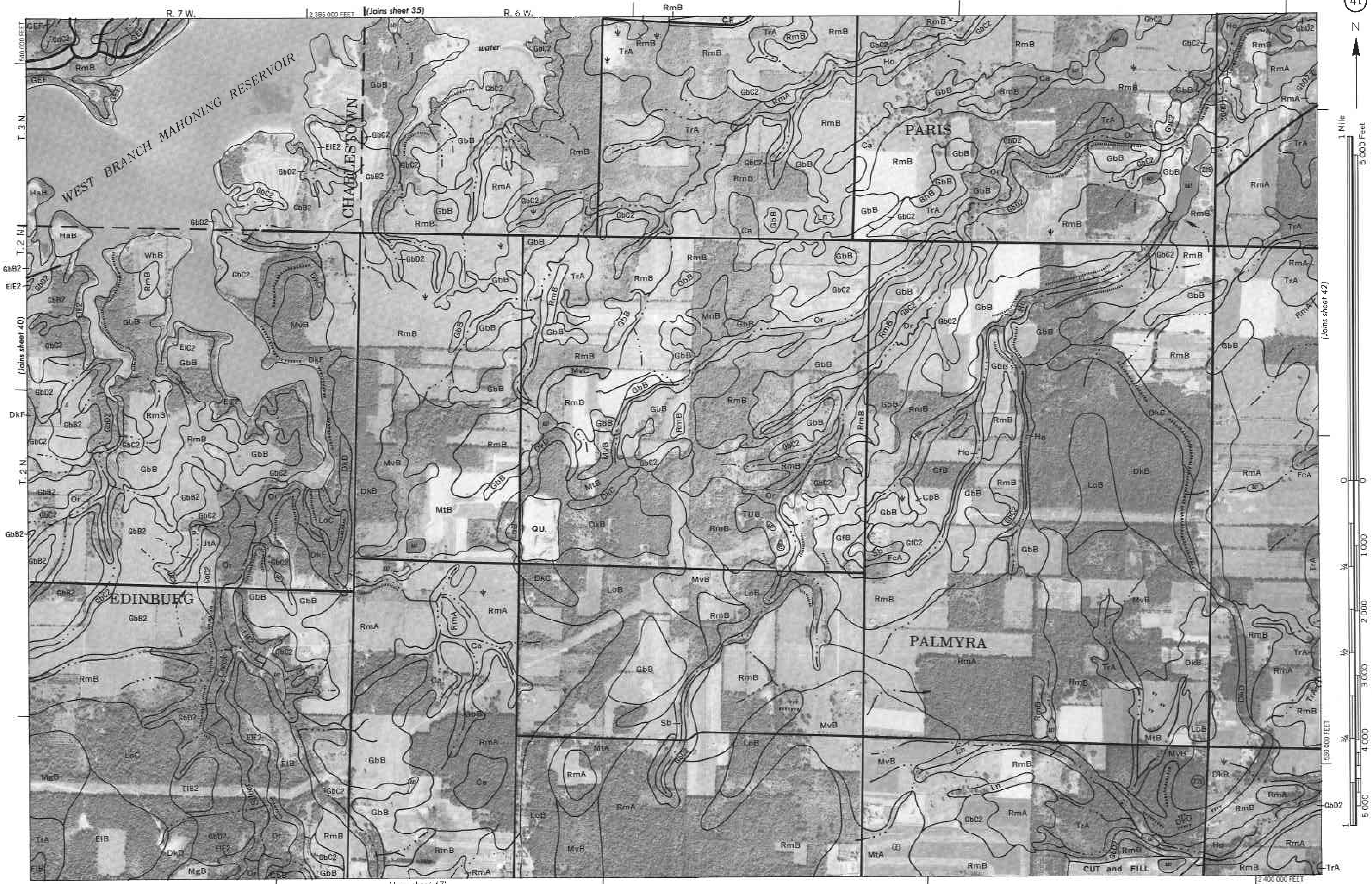
PORTAGE COUNTY, OHIO NO. 38

PORTAGE COUNTY, OHIO NO. 39

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



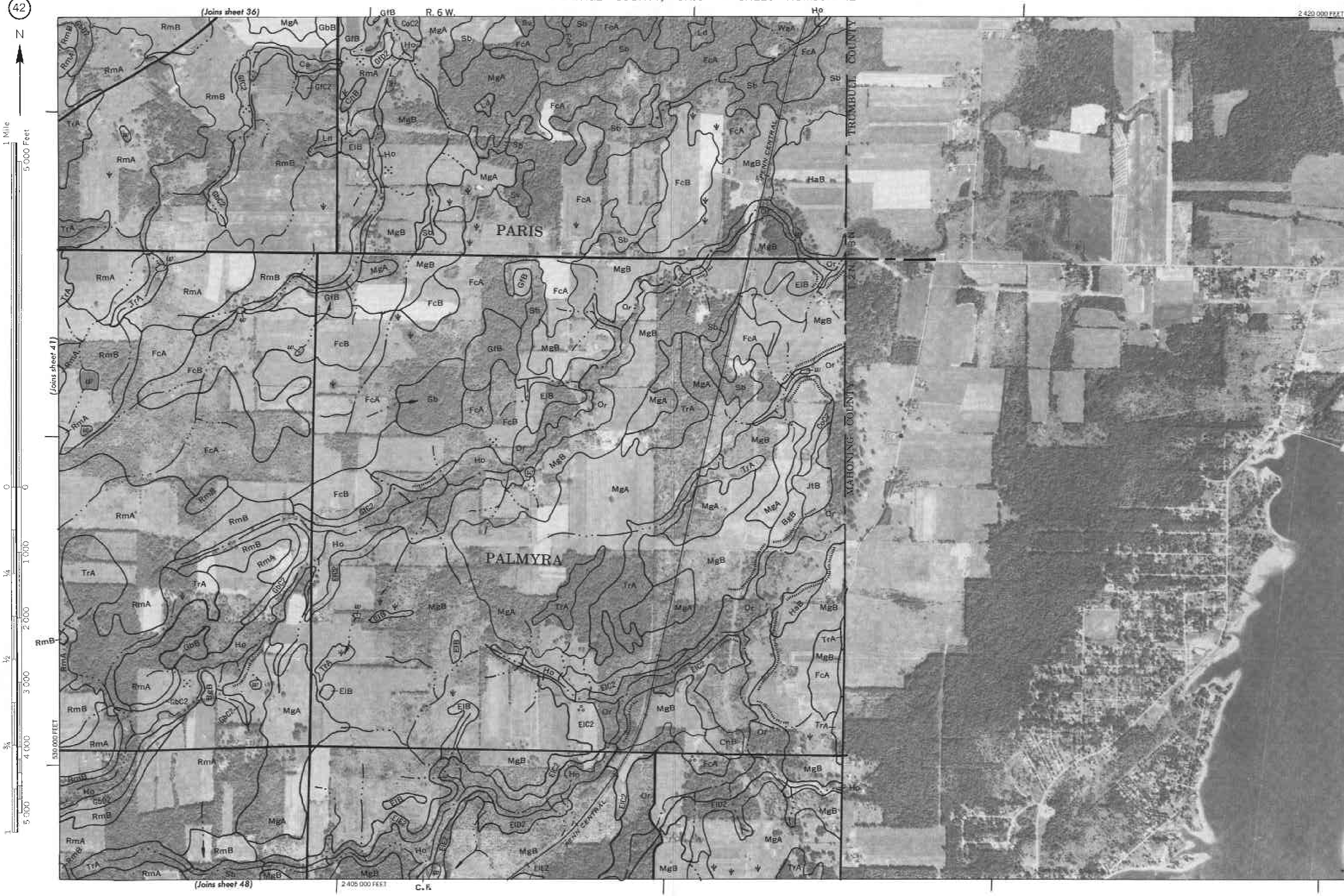
PORTAGE COUNTY, OHIO NO. 40



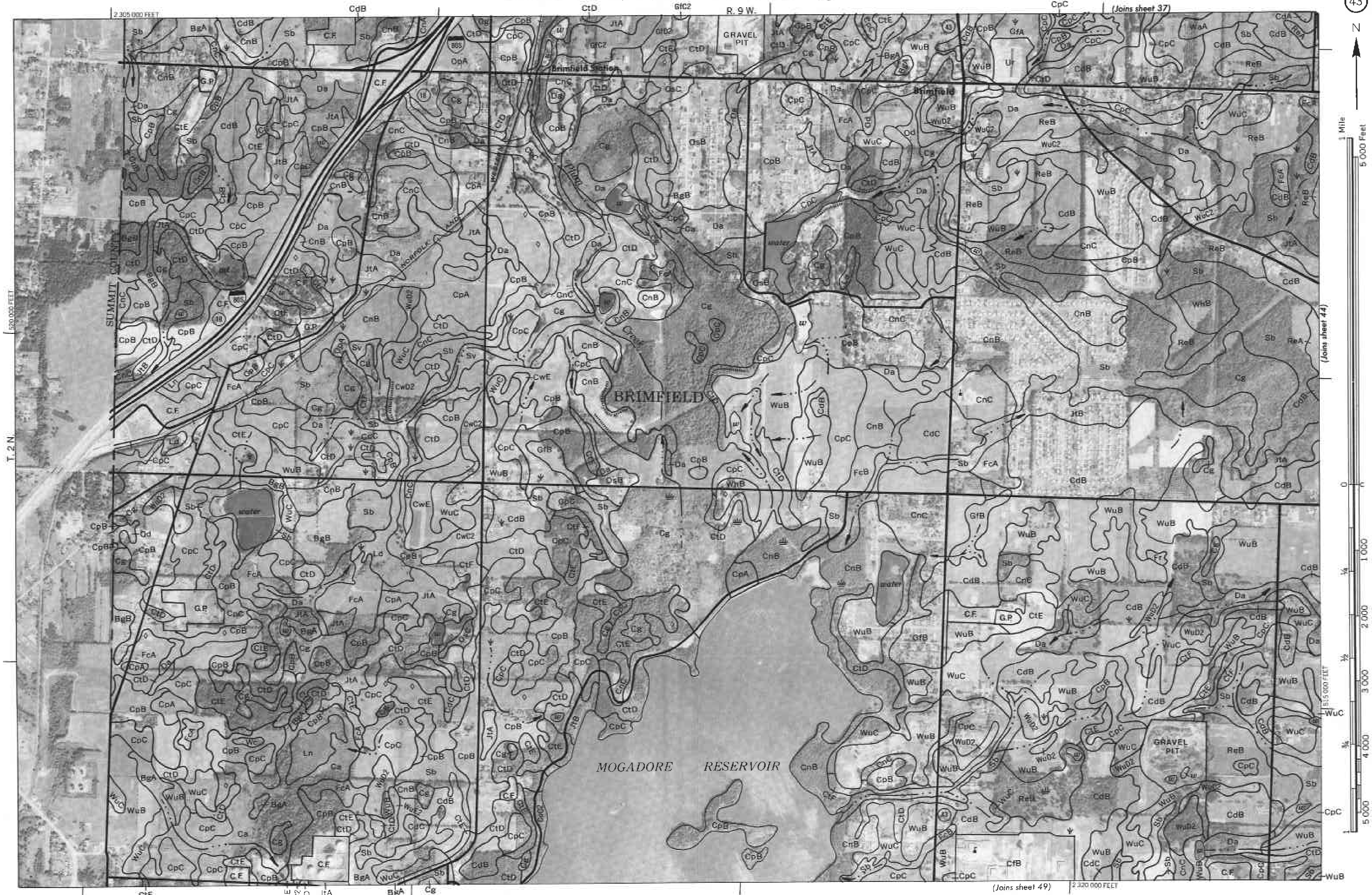
PORTAGE COUNTY, OHIO NO. 41

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO — SHEET NUMBER 42

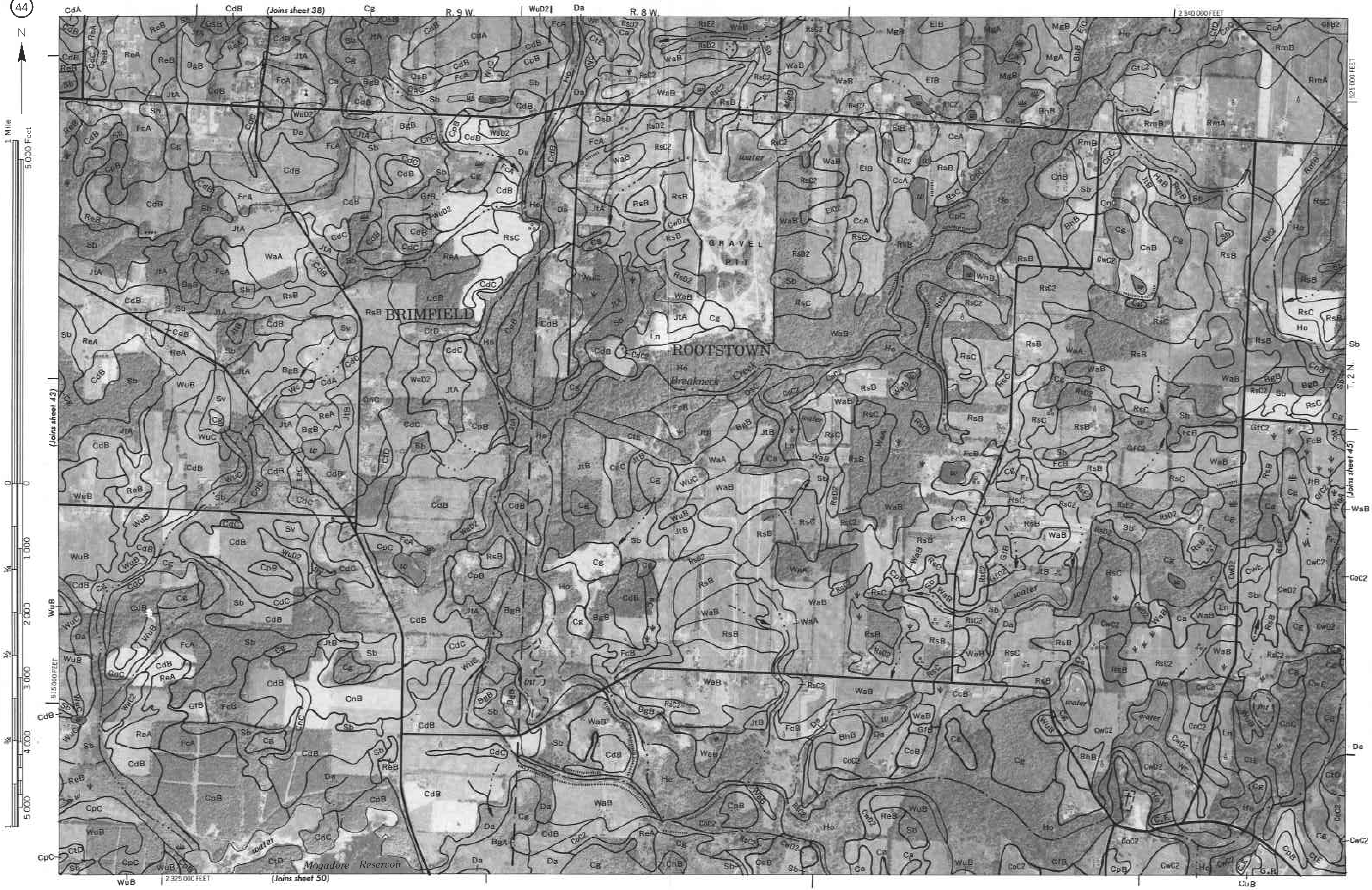


This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

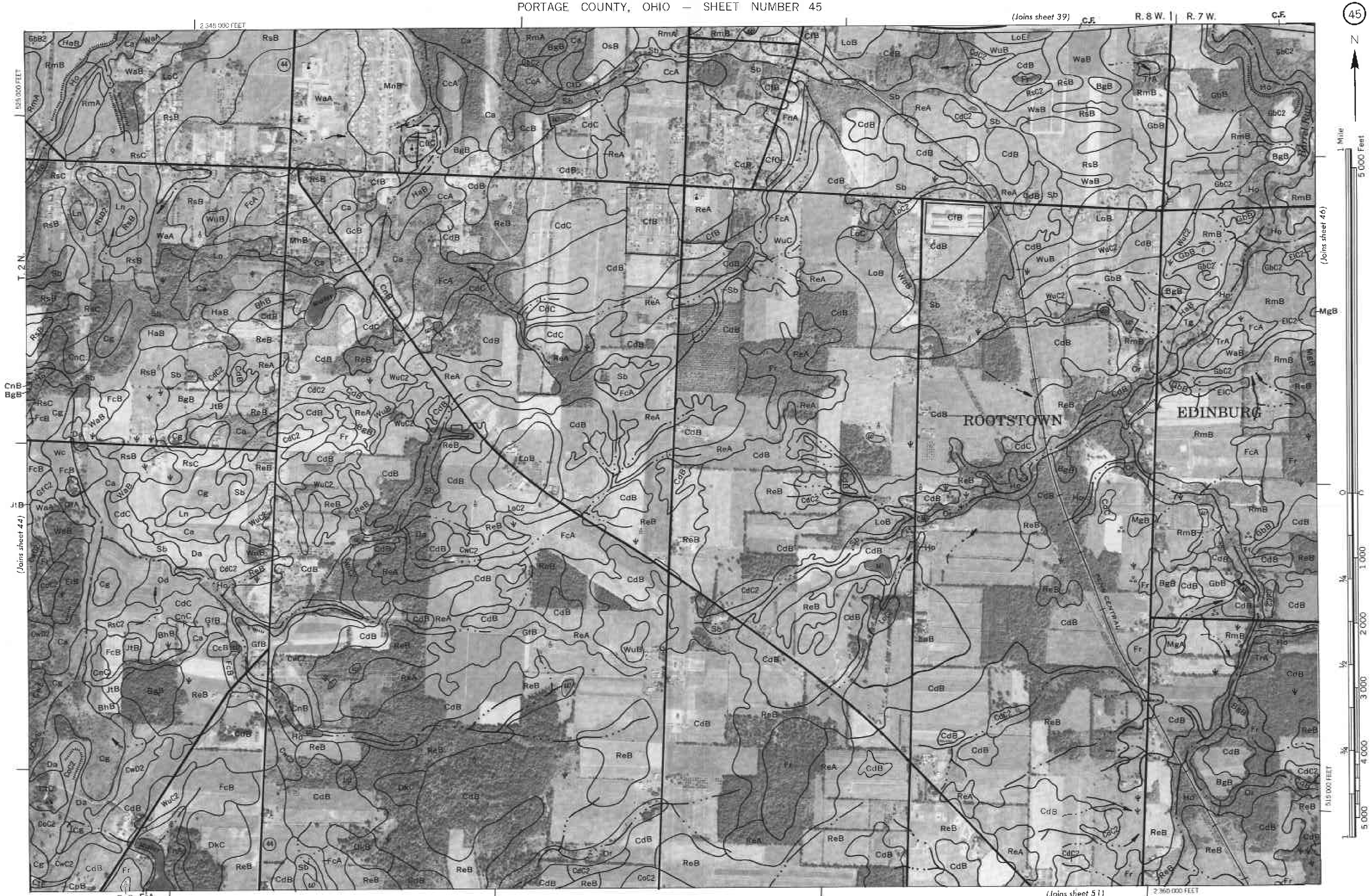


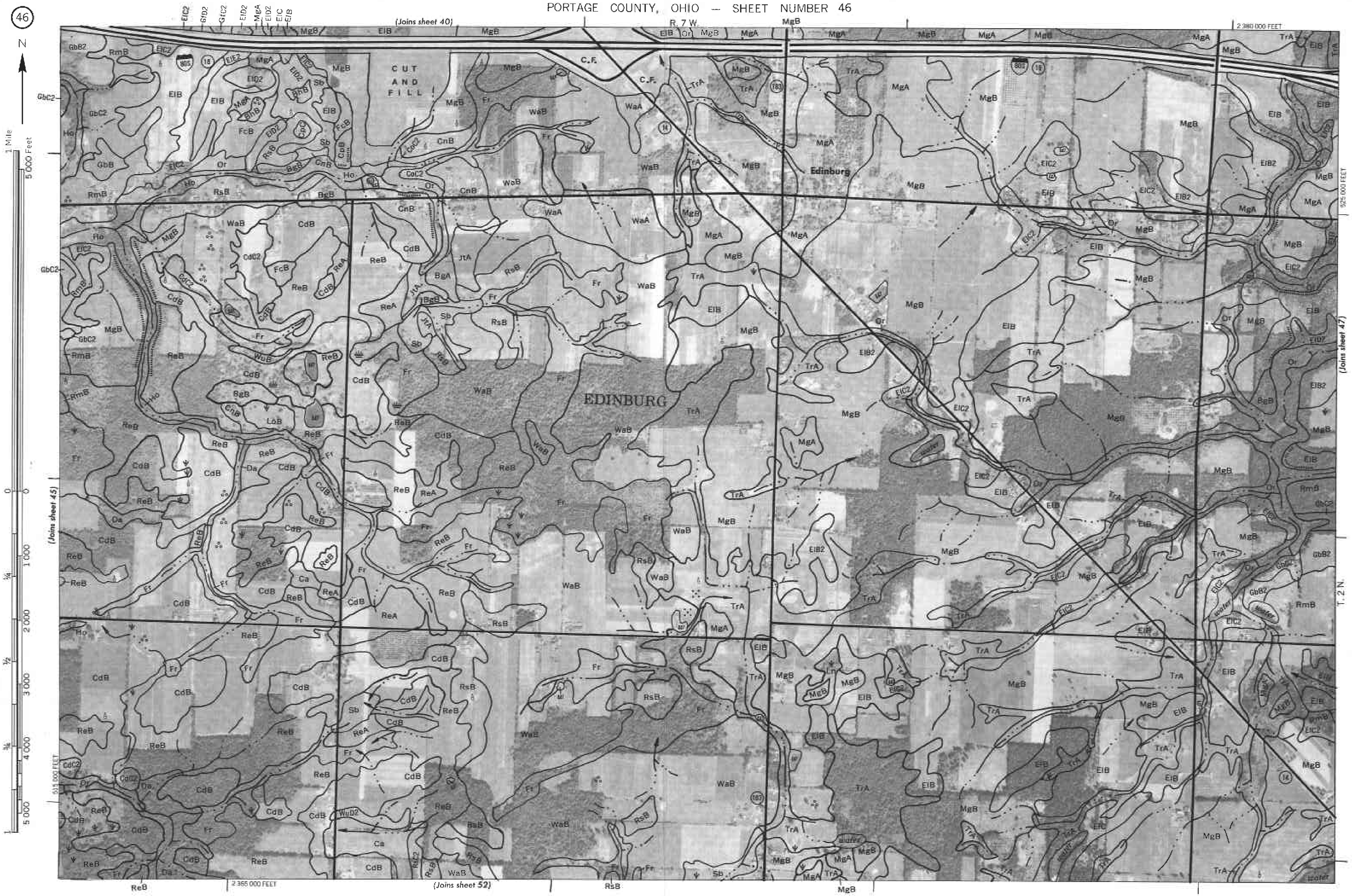
PORTAGE COUNTY, OHIO NO. 43

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



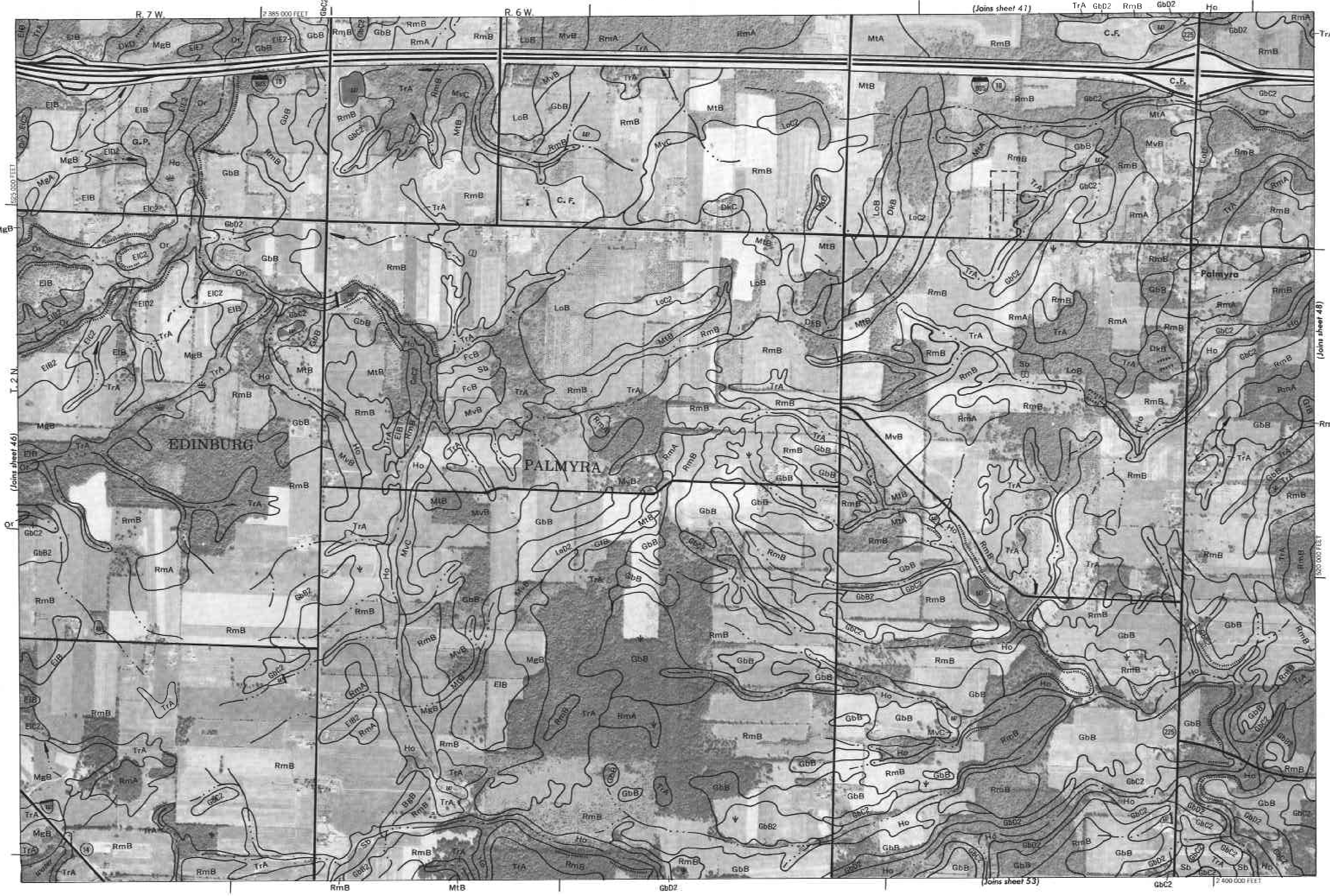
PORTAGE COUNTY, OHIO NO. 44


45
N
(Joins sheet 39)
R. 8 W.
R. 7 W.
C.F.
T. 2 N.
(Joins sheet 44)
(Joins sheet 46)
(Joins sheet 51)
ROOTSTOWN
EDINBURG
2 345 000 FEET
2 360 000 FEET
525 000 FEET
515 000 FEET
1 Mile
5 000 Feet
PORTAGE COUNTY, OHIO NO. 45



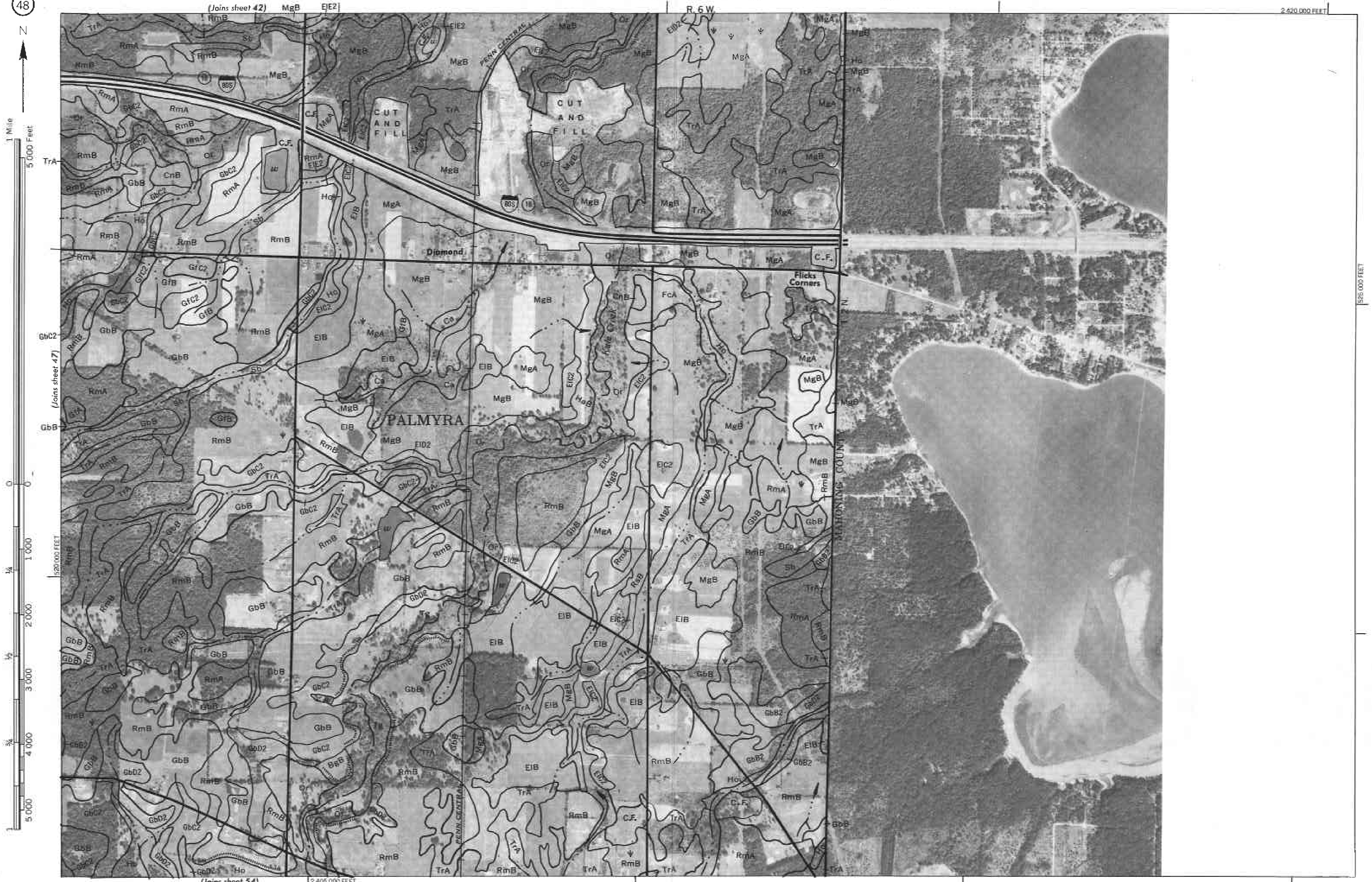
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 46

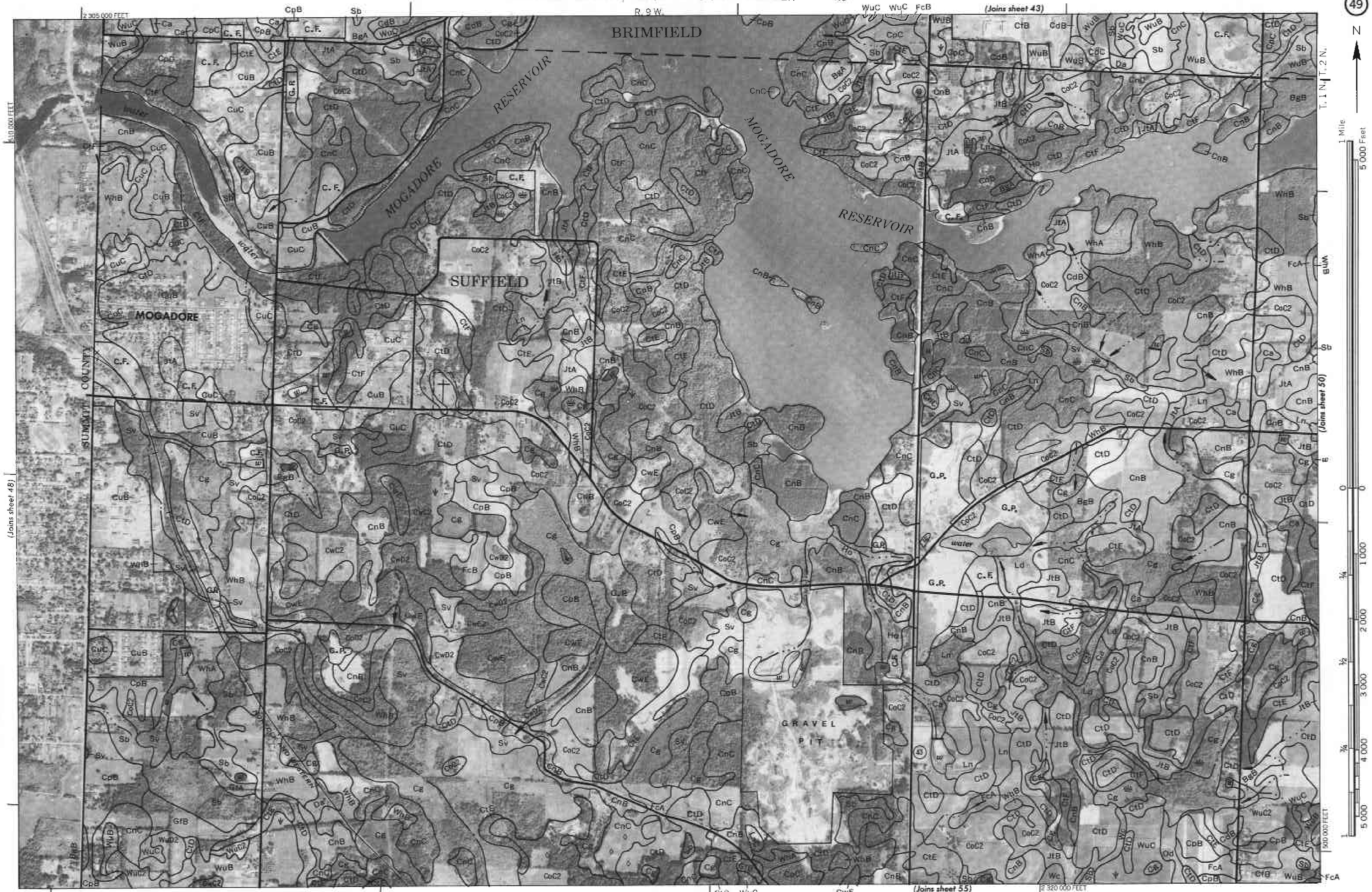


PORTAGE COUNTY, OHIO NO. 47

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

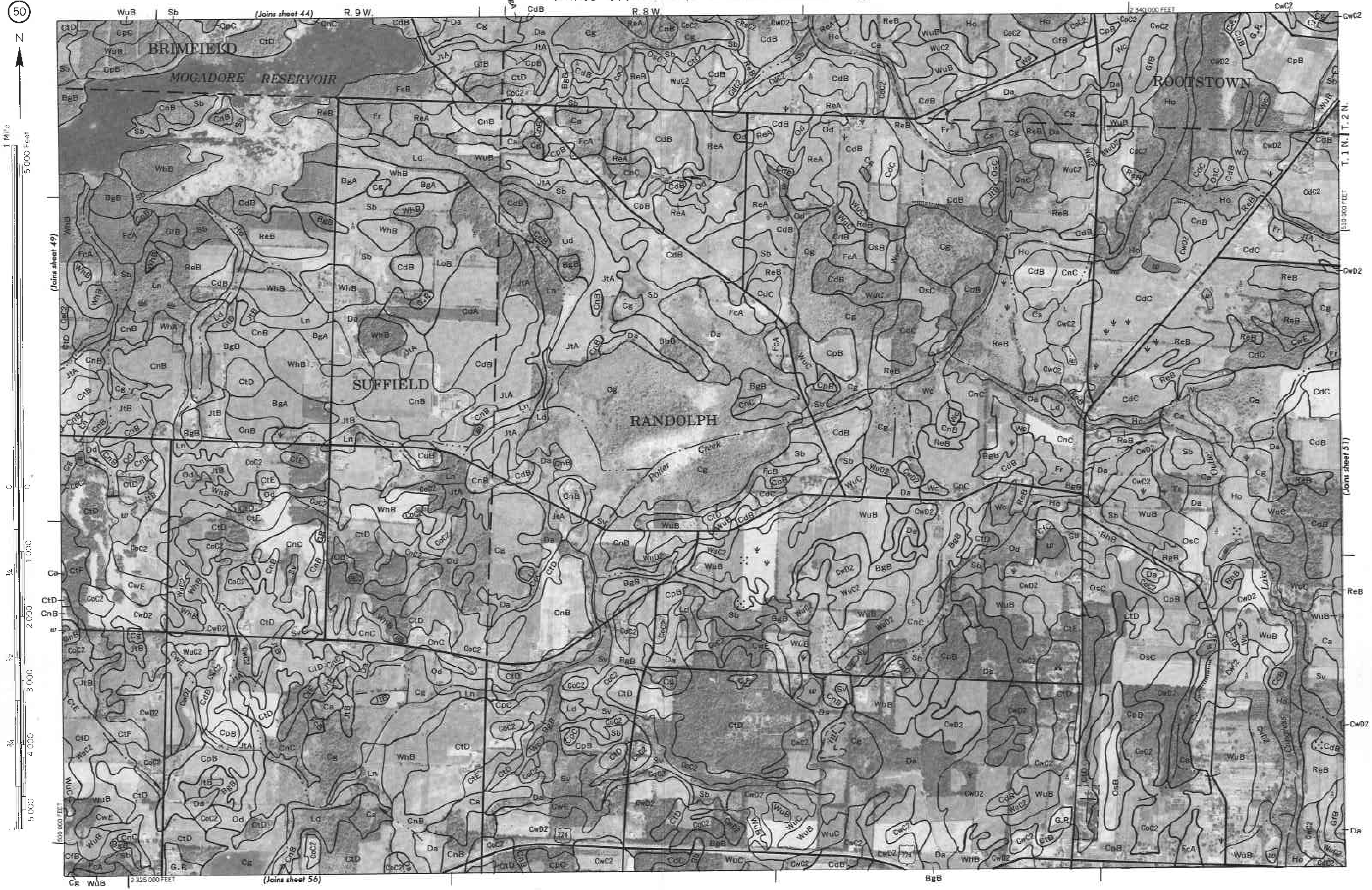


PORTAGE COUNTY, OHIO NO. 48



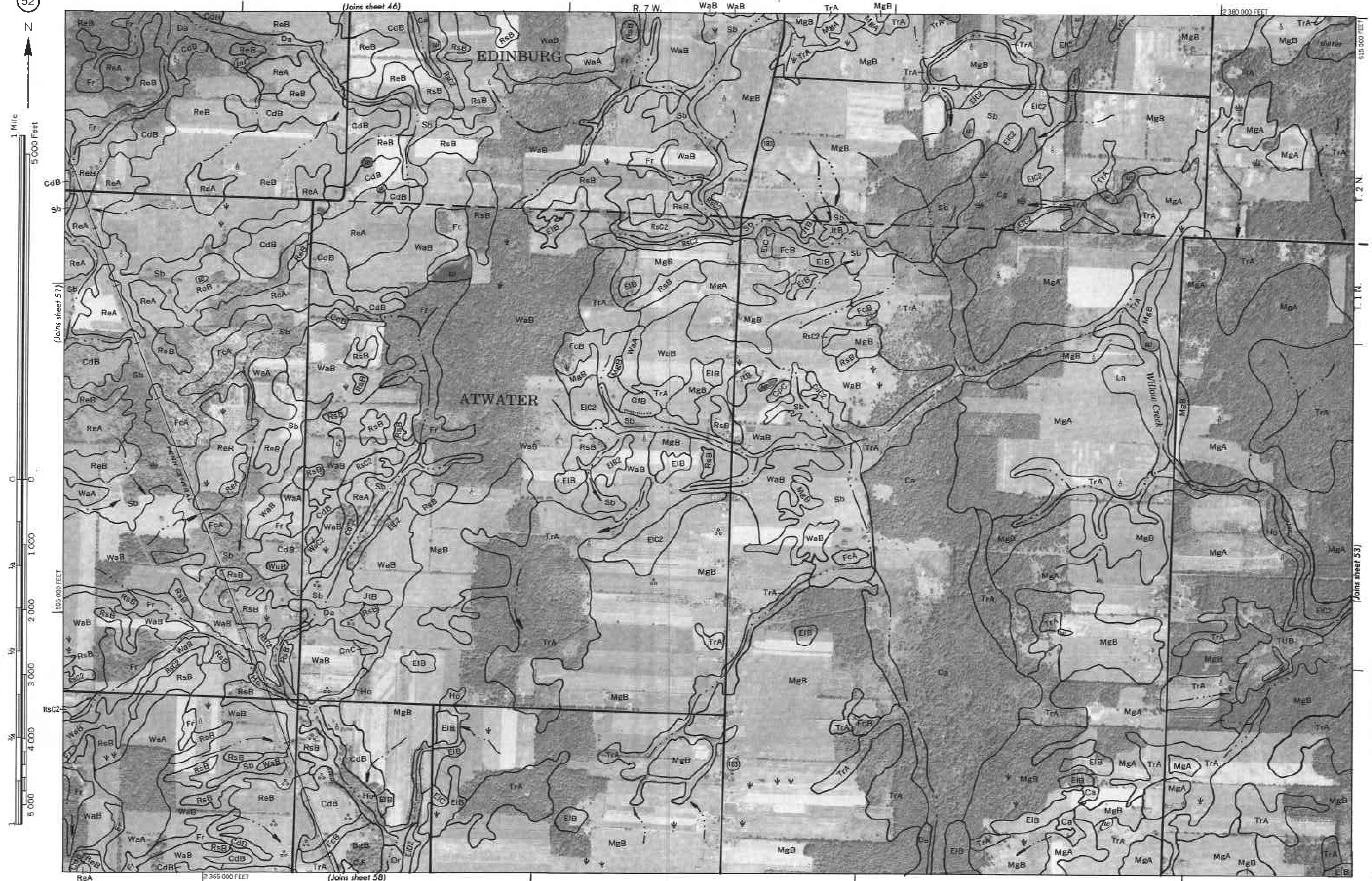
PORTAGE COUNTY, OHIO NO. 49

This map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



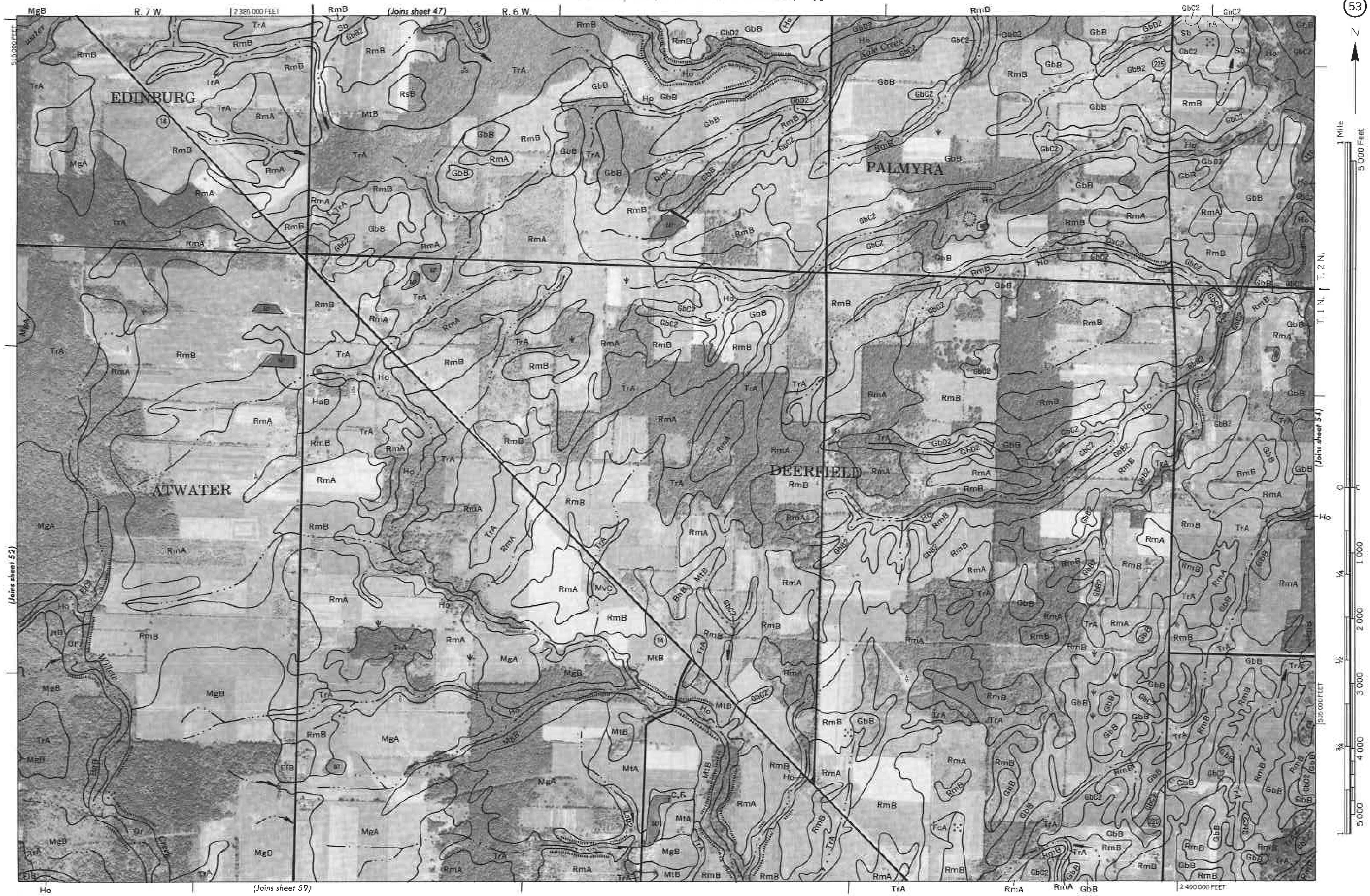
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

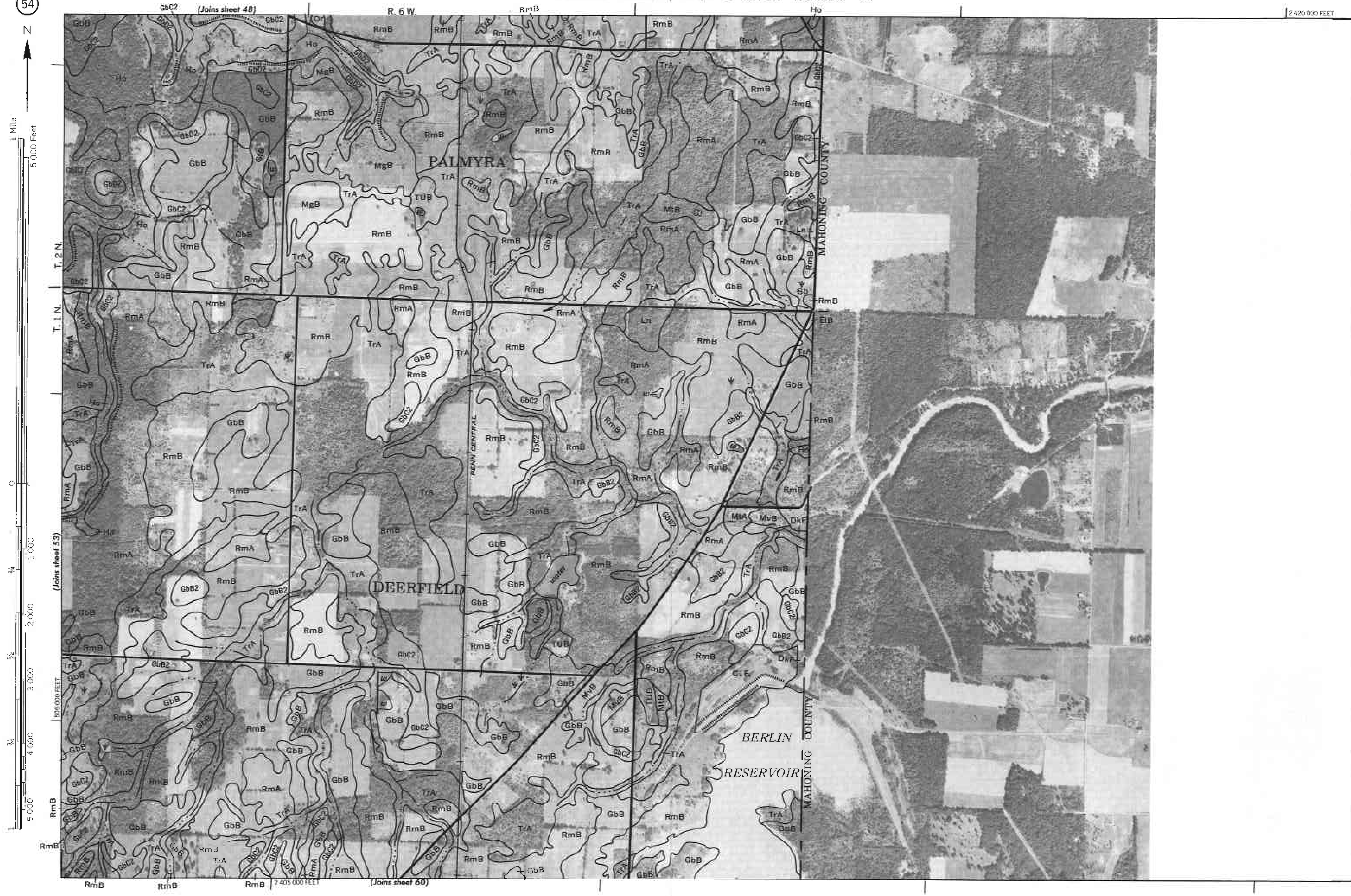


This map is compiled on [illegible] aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 52



PORTAGE COUNTY, OHIO NO. 53



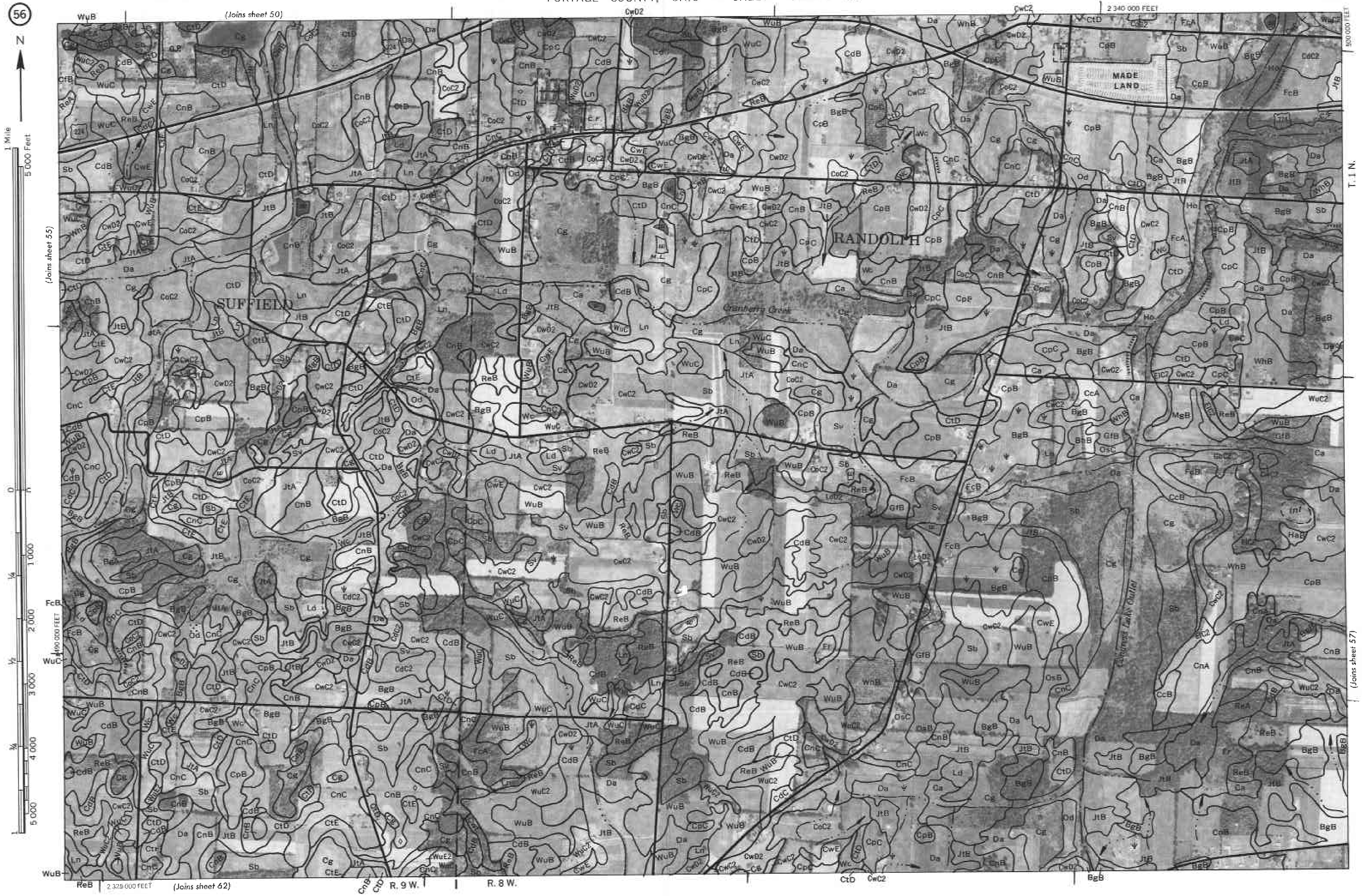
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 54

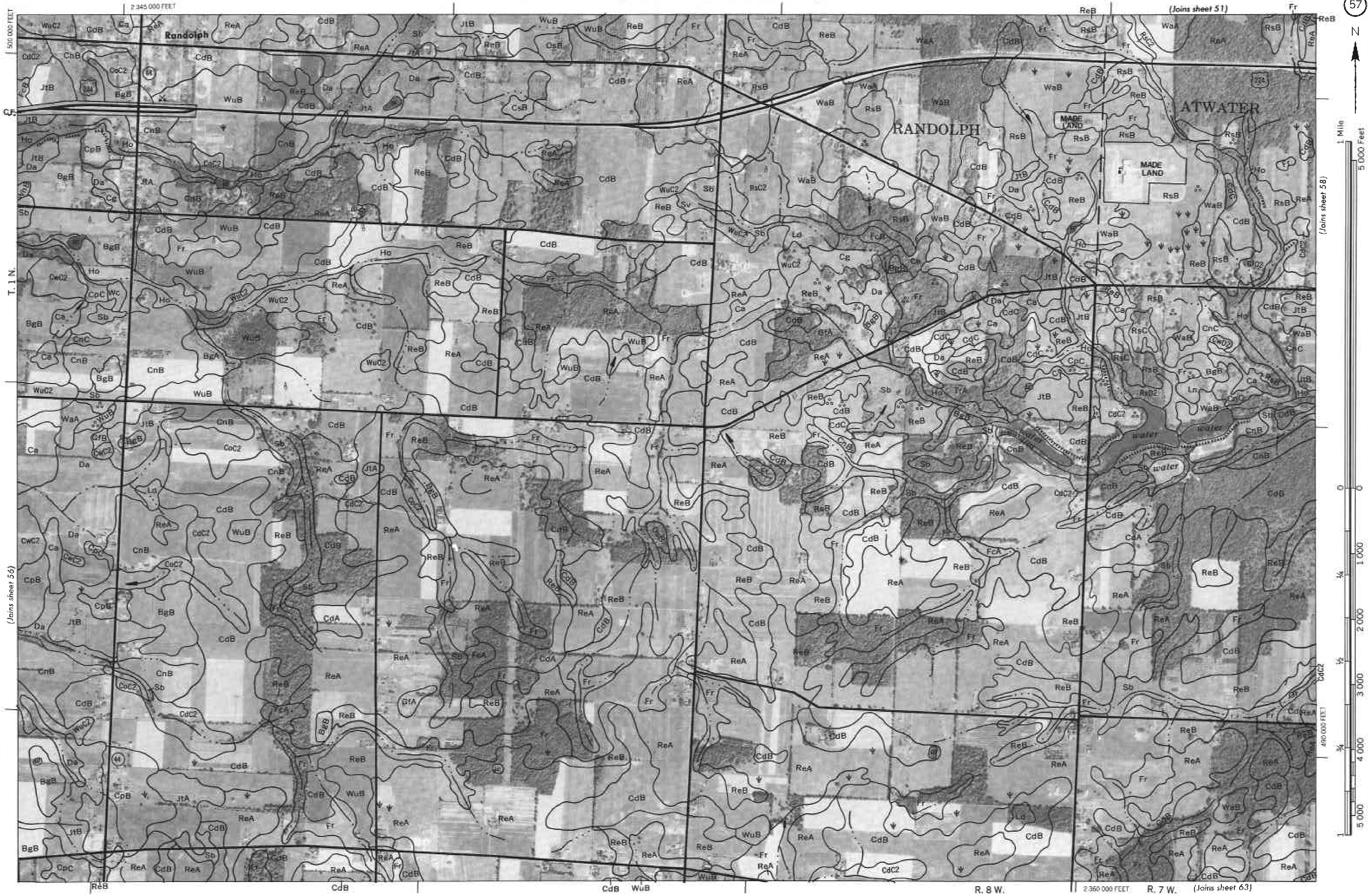
(55)

PORTAGE COUNTY, OHIO NO. 55

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



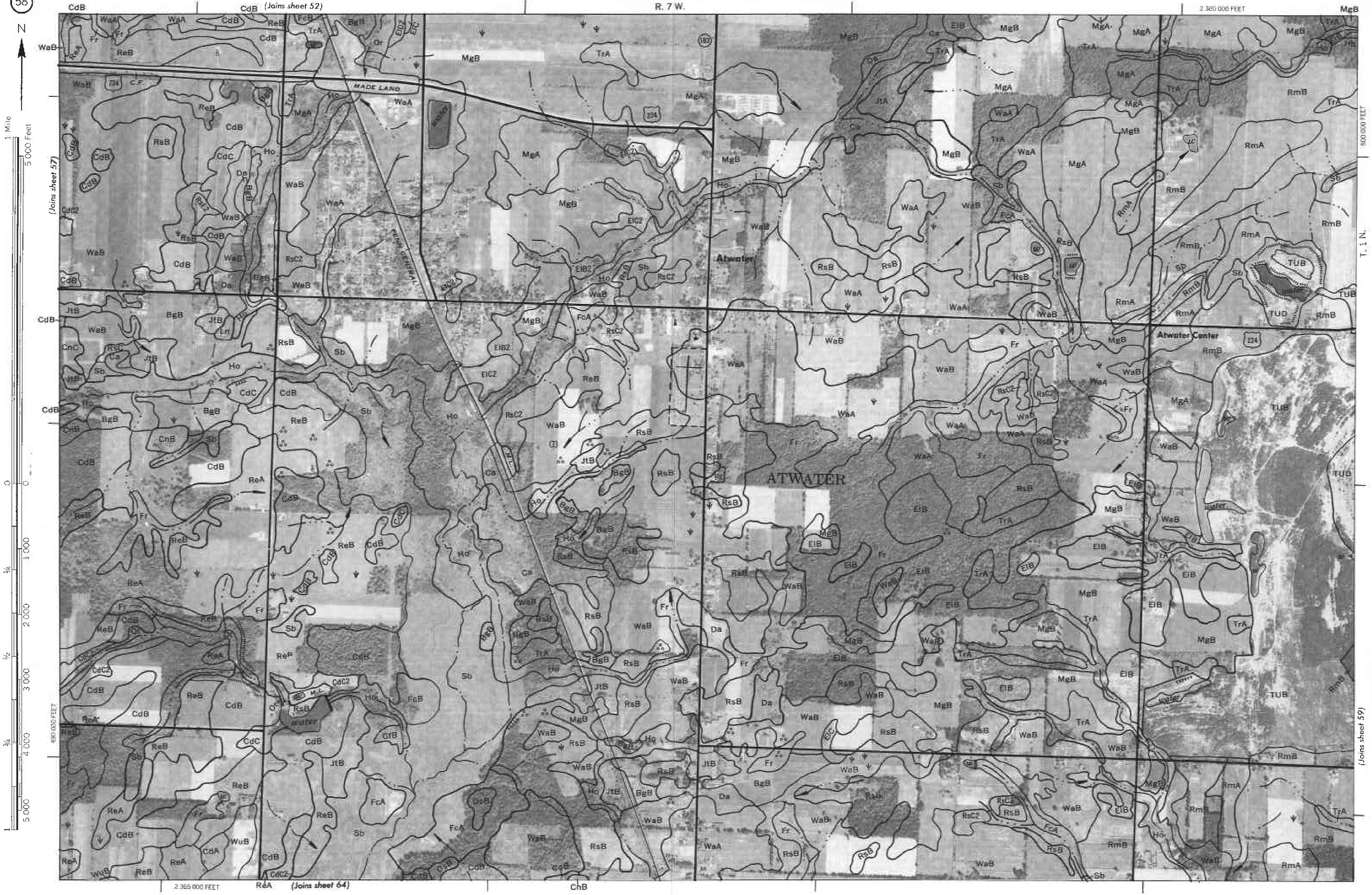
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



PORTAGE COUNTY, OHIO NO. 57.

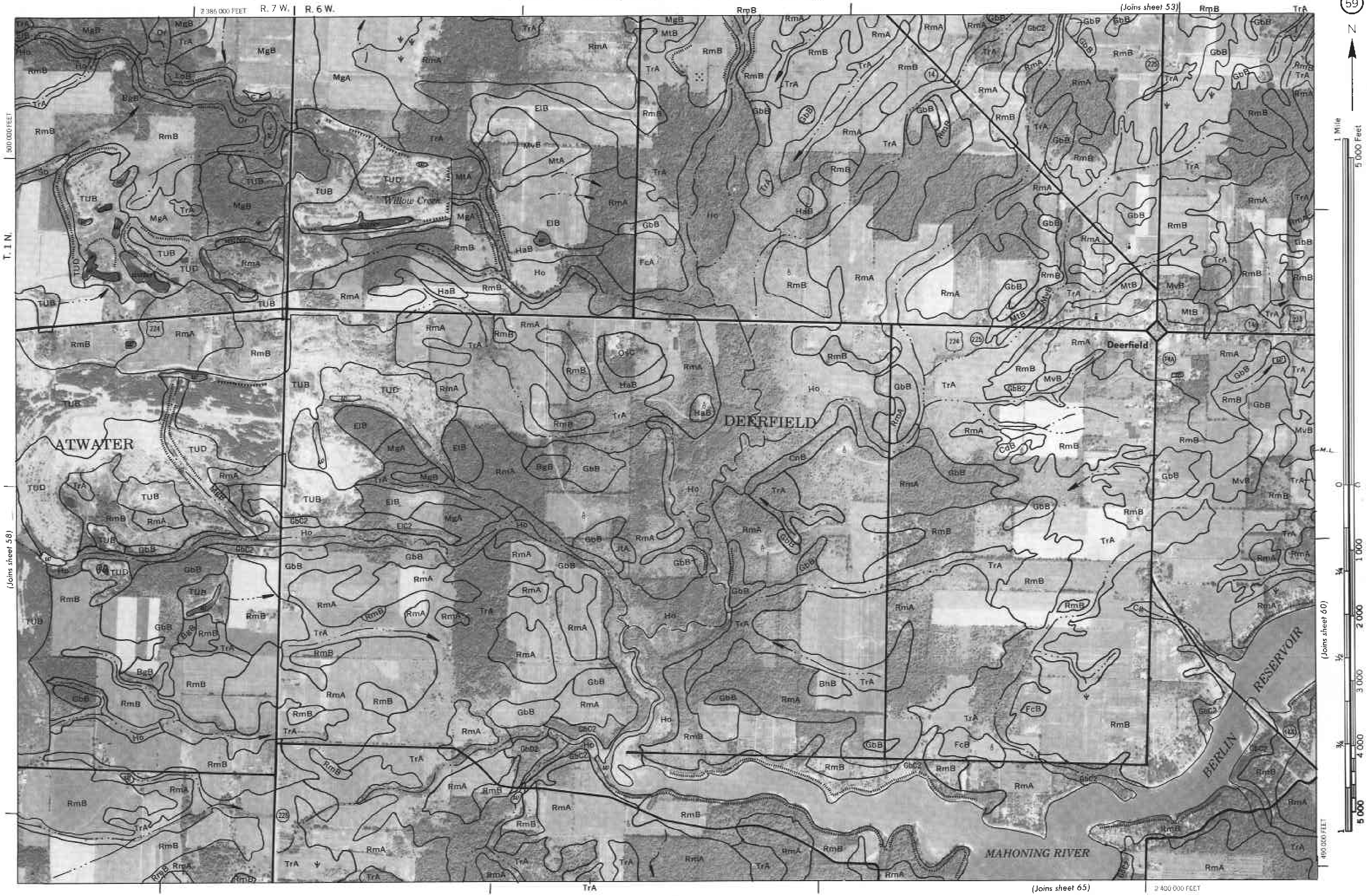
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO — SHEET NUMBER 58



This map is compiled on [illegible] aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 58



PORTAGE COUNTY, OHIO NO. 59

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 60

PORTAGE COUNTY, OHIO — SHEET NUMBER 61

61

PORTAGE COUNTY, OHIO NO. 61

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

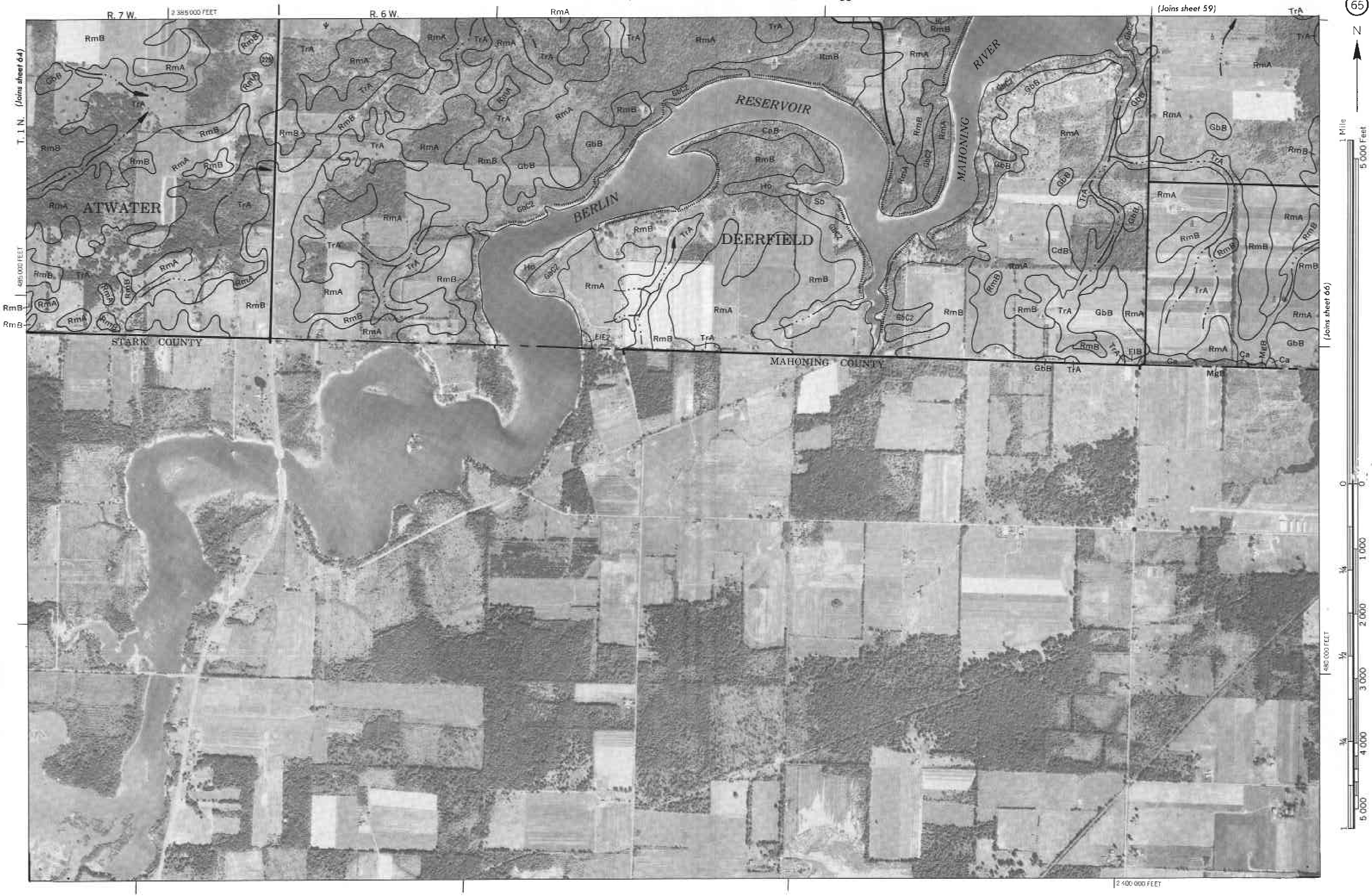
PORTAGE COUNTY, OHIO NO. 62

PORTAGE COUNTY, OHIO NO. 63

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

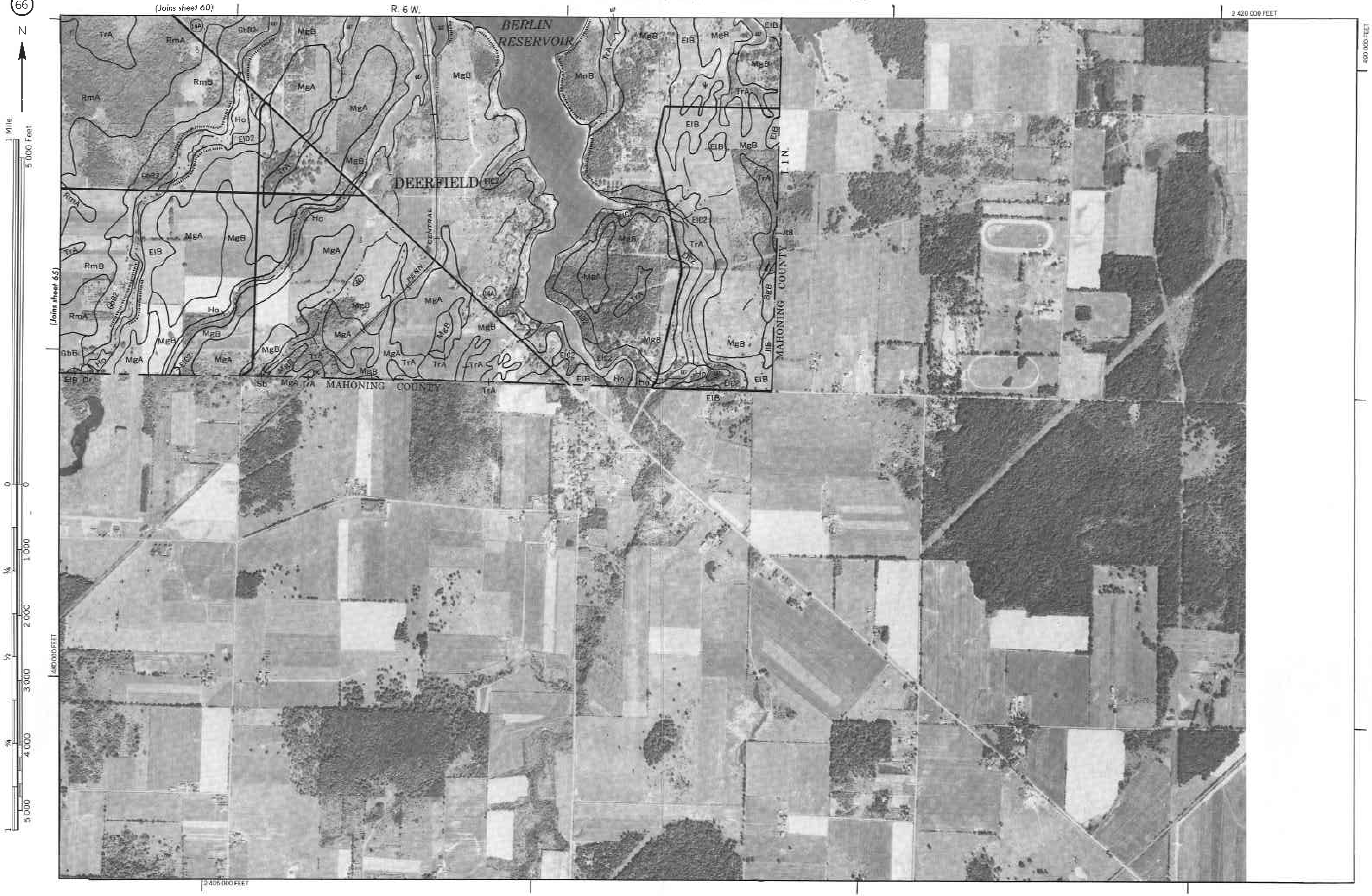
This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

PORTAGE COUNTY, OHIO NO. 64



PORTAGE COUNTY, OHIO NO. 65

PORTAGE COUNTY, OHIO — SHEET NUMBER 66



This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.